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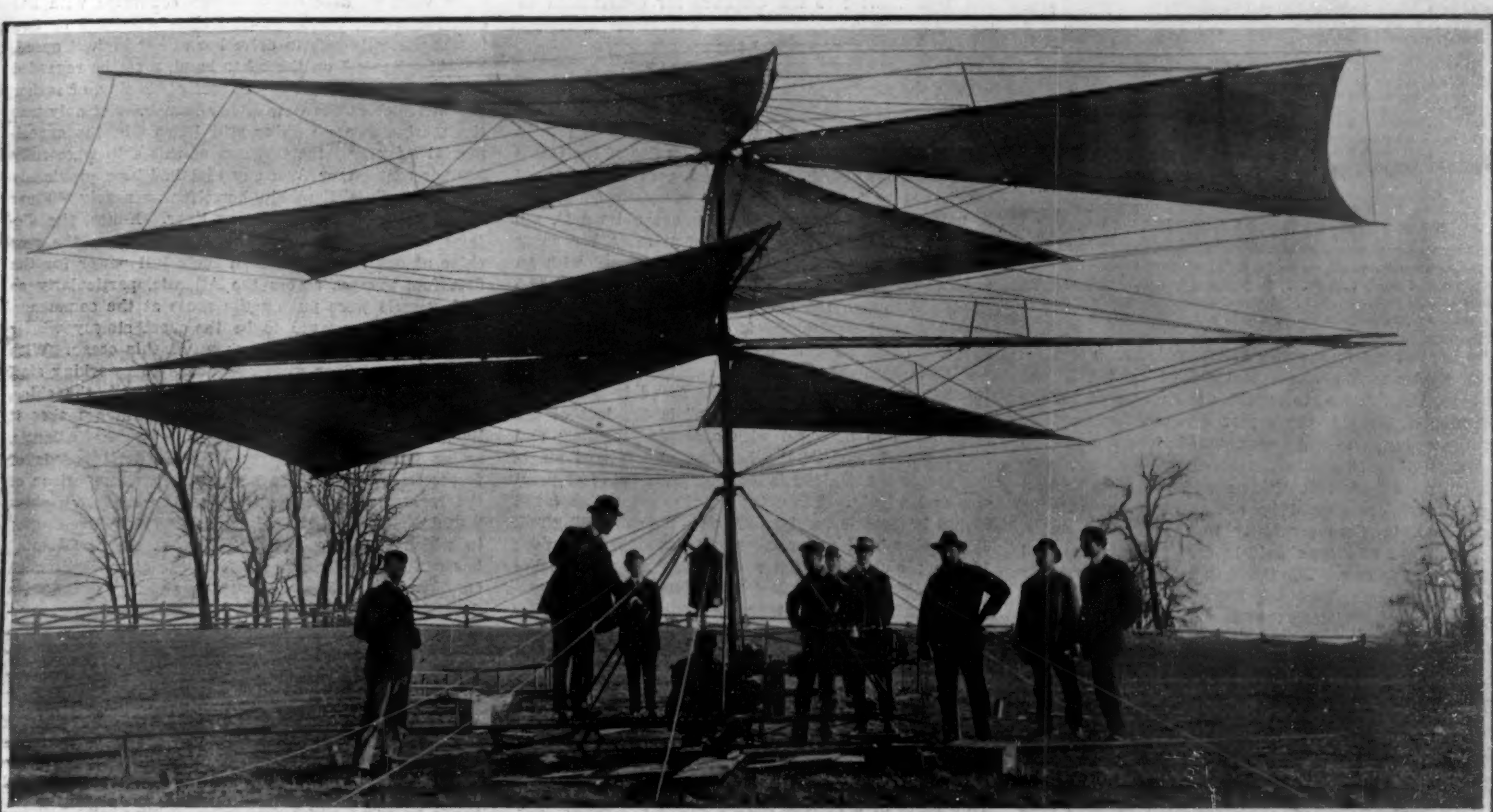

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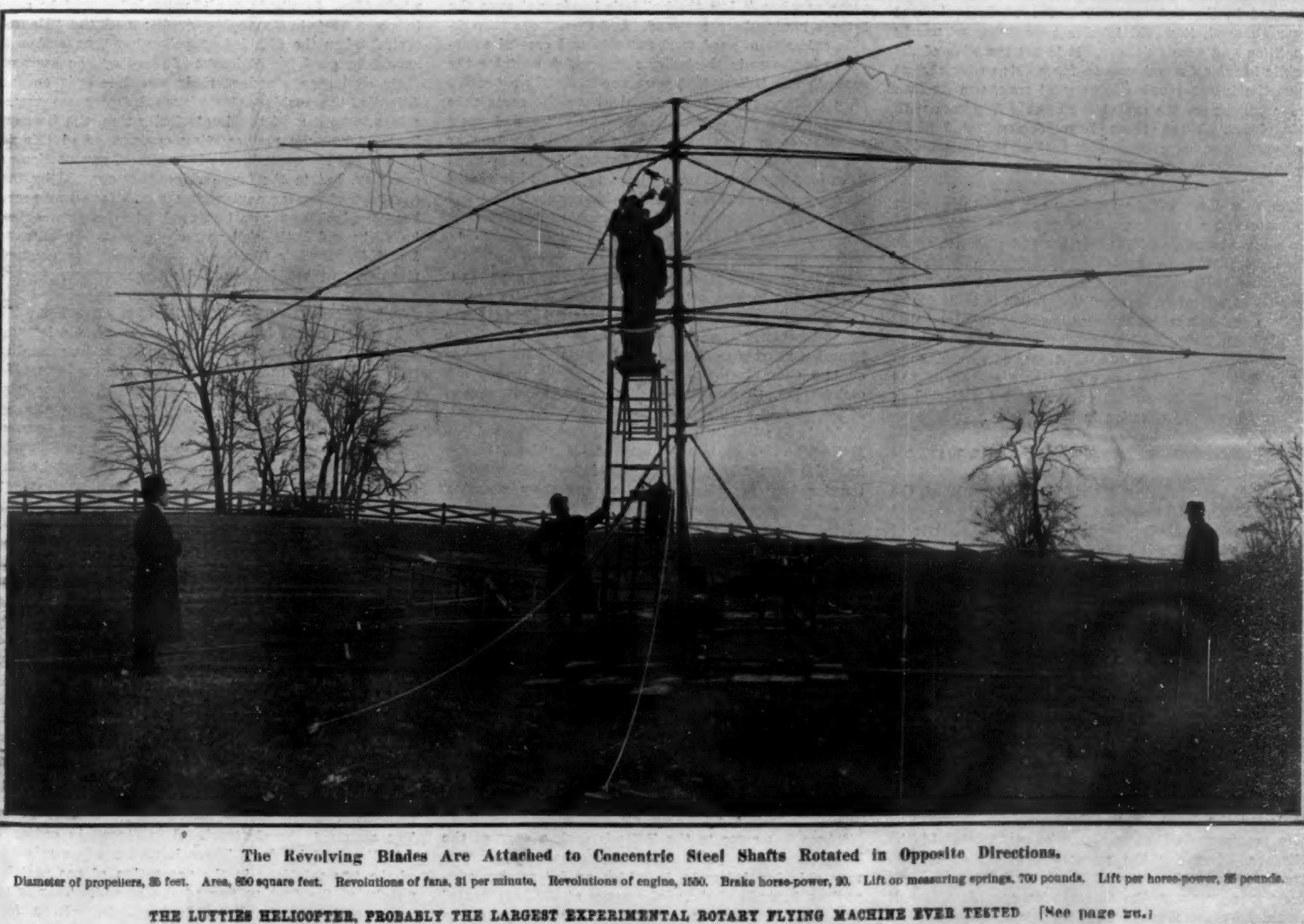

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THE LUYTIES HELICOPTER, PROBABLY THE LARGEST EXPERIMENTAL ROTARY FLYING MACHINE EVER TESTED [See page 20.]

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ESTABLISHED 1845

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NEW YORK, SATURDAY, JULY 11, 1908.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

SIDE DOORS FOR SUBWAY CARS.

A final hearing was recently held by the Public Service Commission, to consider the recommendations of Bion J. Arnold, the expert who was engaged by the Commission to make recommendations for the betterment of conditions in the New York Subway. One of the most important of his suggestions was that an additional door should be cut through the cars at each end, in close proximity to the existing doors, and that one of these should be used for entrance, and the other for exit. The Commission thinks favorably of the suggestion, but the Interborough Company is opposed to it, claiming that it will cost about $2,000 per car or more to make the change, and that the results obtained will not be commensurate with the expense and trouble involved. On the other hand, the Commission believes that the loading and unloading of the cars will be so greatly facilitated, that the length of stops at the station will be shortened, and the carrying capacity of the whole system considerably increased. They believe, moreover, that the consequent enlargement of the company's receipts will more than offset the cost of changing the cars. At present 350 steel cars and 500 composite steel-and-wood cars are operated in the Subway, and if the whole equipment were changed, it would involve an expense of nearly a million and a half dollars. It is not the wish of the Public Service Commission to force this costly change upon the Interborough Company at once, and its first order will be for the equipment of only fifty cars with side doors. When these have demonstrated their efficiency, successive orders for further equipment will be given, until the entire rolling stock has been modified.

The new doors will be used for exit and the present end doors for entrance, an arrangement which will have the advantage of keeping the end platform space clear, so that passengers can pass from the station platforms to the body of the car without delay. A weighty argument in favor of the system is to be found in the great success of the new "pay-as-you-enter cars" on Madison Avenue. The public was very quick to appreciate the convenience of these cars, and soon adjusted itself to the use of separate entrances and exits. There is no reason to doubt that the system will prove equally effective in the Subway.

GOVERNMENT RESTRICTIONS OF NIAGARA WATER POWER.

It will be remembered that as the result of the efforts of President Roosevelt, a joint International Waterways Commission, made up of representatives of Canada and the United States, was appointed to look into the question of the diversion of water from the upper lakes and the upper Niagara River for drainage and power purposes, and determine how much might be so diverted without injury to Lake Erie and the scenic features of Niagara Falls. The Canadian members of this Commission have recently submitted a report to the Canadian Parliament, which recommends that the United States shall prohibit the diversion through the Chicago drainage canal of more than 10,000 cubic feet of water per second, an amount which is considered to be ample for the sanitary necessities of Chicago. If this amount is permitted to flow through the canal, its effect upon Lake Erie will be to lower the level by five inches. The Commission also recommends that no dams be constructed in the Niagara River for the purpose of maintaining the level. In regard to the utilization of Niagara Falls for power purposes, the Commission considers that it would be a sacrilege to mar the scenic effects of the Falls; and it recommends that not more than 36,000 cubic feet of water per second be taken from the river on the Canadian side, and not more than 18,500 cubic feet from the United States side of the river. The Commission will agree to these conditions, only upon the basis that any treaty covering the subject be limited to a term of twenty years. At the present time the three Canadian companies are permitted to develop a total of 400,000 horse-power, one-half of which must be reserved for the Canadian market. The commissioners consider that this one-half of the production will be sufficient to supply the demands of Canada for many years to come; and they believe it would have been wise if the development on the Canadian side had been limited to the demands for distribution in Canada.

MARINE ENGINE ENDURANCE.

That the marine engine builders of twenty-five years ago were accustomed to put the very best of materials and workmanship into ships of the first class is proved by the record of long and arduous service of the transatlantic liners built during that period, a few of which are performing high-class service even to-day. A notable case of this is that famous old vessel, the "Etruria," built in 1885, which soon after her entry into service captured the transatlantic record with an average speed for the whole transatlantic trip of 19.5 knots. Although the ship is entering on her twenty-fourth year of service, she is capable to-day of making her 18.5 knots an hour under favorable conditions of weather. But, for the marine engineer, the points of interest about this ship are to be found in her engine and boiler rooms. The "Etruria" is the last of the large ships to be fitted with a single propeller; and her engine is one of the heaviest and largest single engines ever built, the individual parts being of great size and weight. Thus, the crankshaft, which is 25 inches in diameter, weighs 27 tons; the connecting rod, 13¾ inches in diameter at its center, weighs just under 11 tons; and the piston rods, which are 11¾ inches in diameter, weigh about 4 tons apiece. A single propeller blade weighs 6 tons, and the whole propeller complete 37 tons. The engine is compound, with one 71-inch and two 105-inch cylinders, the stroke being 6 feet.

During a recent visit to the engine room, made for the express purpose of seeing how the engines had stood the heavy strain of their twenty-three years of service, our representative was surprised to learn that, with the exception of the crankshaft and the tail shaft (the parts of a marine engine which are always subject to more rapid deterioration than the rest of the plant) this engine is in all its parts identically the same as when it left the builder's hands, not even the brasses having been renewed. And even more remarkable evidence of good workmanship and careful attendance is shown in the boiler room, which contains the same Scotch boilers that were put in nearly a quarter of a century ago. These boilers have the same tube plates, fifteen per cent of the original tubes, and, most remarkable of all, the same corrugated furnaces as when they left the builder's hands. The ship must have paid for herself many times over; and her record stands as a protest against the cheaper materials and more hasty workmanship that have been developed by the present-day demand for cheaper ships.

EXTENSIVE ELECTRIFICATION OF GERMAN RAILROADS.

According to a report from the United States consul at Brunswick, Germany, the government is in favor of commencing the electrification of certain of the Prussian railroads. The first installation will be made on two short sections of line, and if the results are satisfactory, there will be a more important change of power, first on the Magdeburg-Bitterfeld-Leipsic line, which is 80 miles in length, and then upon the Leipsic-Halle line, which is 22½ miles long. The Ministry has already made a preliminary investigation to determine how far electric traction can show a saving over the present steam traction, and the managements of the two roads concerned have been instructed to make their own estimate for comparison with the results obtained by the government. It is considered that the existence of bituminous deposits on the Halle-Leipsic road gives the proposed electric installation a decided advantage over the present operation by steam, since this fuel, which is not suitable for locomotives, will be serviceable in the one large electrical generating station, to be built in the center of the coal fields, which will supply current for the operation of both lines. The local passenger service will be taken care of by a frequent service of light trains, while the express and freight trains will be hauled by electric locomotives.

A QUESTION OF SPEED.

There has come to the Editor's desk a copy of the Leuchthurm, a publication that deals with German shipping interests, in which an interesting comparison is made of the performance of the "Lusitania" and the "Kronprinzessin Cecilie." The writer draws attention to the fact that the average speed of the "Lusitania" for her first seven voyages to the eastward was only 0.3 of a knot higher than that of the crack German steamer, and that for the first seven westward trips it was not more than 0.2 of a knot higher. Assuming that this comparison is correct, it proves nothing as to the relative efficiency of the two types of ship, not even as far as these earlier voyages are concerned. The "Cecilie" is driven by reciprocating engines, which represent the ultimate development of a type that has grown to its present perfection through a long line of superb vessels, built and run during the past few years by the two great German lines. When the "Cecilie" was put upon the transatlantic route, there were no unsolved questions connected with her construction or operation, and after a voyage or two it was perfectly safe to drive her at her highest speed. The "Lusitania," on the other hand, must be regarded as the greatest marine experiment of the day, or rather she was such at the time of her launch. Not only was the marine steam turbine still largely in the experimental stage, but the turbines of this ship were fully 300 per cent larger than any that had been previously installed, while the ship herself was nearly 40 per cent larger than any existing liner. Hence, the dictates of prudence made it necessary to run the new ships at something less than their full power for the first few voyages across the Atlantic, particularly as both vessels were put on the route at the commencement of what proved to be the most stormy winter experienced for many years past on this ocean. With the advent of finer weather and as the working staff have become thoroughly familiarized with the ships, their speed has increased at a rate which makes it likely that they will ultimately cross the Atlantic, under favorable conditions, at their trial speeds of respectively 25½ and 26 knots. A true comparison of the reciprocating engine and the turbine-driven ships would be to take two of the later summer voyages; in which case it will be found that the "Lusitania" has run practically the whole of the distance between the Fastnet and Sandy Hook at a speed of 25 knots, a detention by fog on the banks bringing down the average to 24.83. The "Mauretania," using only three screws, and presumably only three-quarters of her horse-power, has done slightly better, averaging, for the run, 24.86 knots. For her westward and eastward voyages, made at about the same time, the "Kronprinzessin Cecilie" took 137 hours and 135 hours respectively over the course from Cherbourg to Sandy Hook, and that from Sandy Hook to Plymouth. The speed on these two voyages works out at an average of about 23 knots. The German ship under favorable conditions should be able to make 23½ knots for the whole trip. Similarly, the "Lusitania" should be able to place 25½ knots to her credit; and the "Mauretania," when the disabled propeller has been replaced, should be good for 26 knots. Judged on the basis of their trial speeds and of their actual records on the Atlantic, the turbine-driven boats have shown themselves to be a good two knots faster than the German boats, driven by reciprocating engines. And this is as it should be—not in the interests of any particular company, but in the broader interests covered by the great art of marine engineering, which for many years has been looking for an improved drive for steamships, both big and little, and now seems certainly to have found it, whether for the torpedo boat, the channel steamer, or the 45,000-ton, 25-knot ocean liner.

ELECTRO-PLATING NON-METALLIC ARTICLES

The prime requisite in producing an electrolytic coating on wood, paper, cloth, or other non-metallic material, is that the latter shall first be made capable of receiving such a coating. Once this is done, the article can be coated as readily and permanently as though consisting of metal. For many purposes, a coating of fine graphite suffices to make it sufficiently conductive; but naturally this process can not be employed with very delicate articles, such as flowers; since the application of the graphite would destroy the texture and structure by filling up the fine lines.

One of the best processes for making the surface of the article an electric conductor consists in giving it an impalpable coating of metallic silver. This can be done by first immersing it in a 10-per-cent alcoholic solution of silver nitrate, and letting this dry on; then dipping in a 10-per-cent solution of yellow phosphorus in carbon disulfid. There will at once be formed a deposit of metallic silver, on which a further deposit of silver or any other metal may readily be made by the aid of a battery in the usual manner.

Another process consists in dissolving silver nitrate in several times its weight of distilled water and adding ammonia until the precipitate which at first forms is redissolved. A second solution is then made of formaldehyde in three times its weight of distilled water. The article to be electroplated is dipped in ordinary collodion and let dry. There is next made a mixture of the two solutions in the proportion of one part by weight of the first to two of the second. This is at once applied to the collodioned article. In a few

minutes the silver is reduced and precipitated on the article to be metal-plated, and the process of electroplating in the ordinary manner may then be taken up.

FURTHER NOTES ON THE STAR AND CRESCENT.

BY LT.-COL. C. FIELD, R.M.L.I.

A good deal might be added to the interesting little article on the "Origin of the Star and Crescent," which appeared in the Scientific American for May 9, 1908. For instance, it is related in the Book of Judges (viii, 21-24) that Gideon took from Zebah and Zalmunnah, kings of Midian, ornaments like the moon that were on their camels' necks. The Midianites were Ishmaelites and thus ancestors of the Turks, so it is not improbable that the symbol was derived from them and in use long before the taking of Constantinople in 1453. What lends some confirmation to this theory is the fact that Richard Cœur-de-Lion adopted this badge after he returned from the Crusades, having assumed it, it is said, in commemoration of the victory which he with his galleys gained over the great Turkish dromon off Beyrout in the year 1191. This, practically the first English naval victory, was celebrated both in song and history by the chroniclers of the period. They seem to have been greatly impressed with the enormous size of the Turkish ship, which must have been a very "Dreadnought" of her day. She was bigger, they say, than anything ever seen at sea, gaudily painted in yellow and green, and carried no less than 1,500 men, among whom were seven Emirs, and 80 chosen Turks, for the defense of Acre, and was laden with bows, arrows, Greek fire in jars, and "two hundred most deadly serpents prepared for the destruction of Christians." Possibly these "serpents" were a species of firework or rocket. The "serpentine" was a very early and very small piece of ordnance. King Richard's gallies attacked her in vain for a long time, as their crews could not climb up her lofty sides despite the encouragement held out to them by their royal leader, who promised to crucify the last man to board her. Eventually several galleys drew off, and putting on full speed rammed the big dromon together in the same spot with such effect that she began to sink. The English were now able to get possession of her and to throw overboard and drown the remainder of her crew according to the pleasant custom of the days of chivalry.

Portsmouth at this time was, as now, one of the principal naval ports, and when in 1194 King Richard set sail from thence at the head of a fleet of 100 ships, he as a special honor bestowed the royal crescent badge upon the town as its coat of arms. "A crescent of gold in a shield azure with a blazing star of eight points or rays of silver between its horns" is the exact description of the device which to this day meets the eye everywhere in the municipality. Thenceforward, too, the crescent and star became the official badge of the admiralty and was used as such up to the year 1545, when it was superseded by the anchor. The old badge is thus described by a writer in the reign of Henry VIII: "Ye Badge of Ye Admyraltye ys a Cresante with Burninge Fyre."

Possibly the old badge is accountable for the constant recurrence of the name "Crescent" for a ship of war, not to mention the "Moon," in Elizabeth's navy, Hudson's "Half-Moon," and the "Three Half-Moons" of Portsmouth, captured by the Turks in 1563.

The crescent, too, is frequently met with in English heraldry, being generally used to denote the second sons of families, and there have been more than one Christian Order of the Crescent, notably that founded by Charles I, King of Naples, in 1268, and another instituted by René Duke of Anjou in 1448, neither of which, however, had a very long existence. The Turkish Order of the Crescent was of very much later date; not being instituted before 1799, the famous Lord Nelson in 1801 being the first person to receive it.

In addition to its official use as a badge and in heraldry, the crescent and star, according to Boutell ("Monumental Brasses and Slabs"), would appear to have been a favorite device in England. He is inclined to think that it may have been connected with Masonry. He mentions a monogram upon a brass in Cambridgeshire which he supposes to be that of the artist by whom it was executed. "It consists of the letter N, above which is a mallet having on one side a half-moon and on the other a star or sun. It is worthy of remark that the same device (without the letter) is found on a seal attached to a deed of the 5th of Edward I, wherein one Walter Dixi, Cementarius de Bernewelle, is conveying certain lands to his son Lawrence." The half-moon and star also appear upon a brass in Trunch Church, Norfolk, and, says Boutell, "is continually found in both public and private seals." It seems possible that what the writer terms a "mallet" may be intended for a cross which in combination with the crescent and star may have some special religious significance.

Over in Ireland, still further to the west, this eastern emblem has left its mark. The crescent and star is to be seen among the carved decoration over the stalls occupied by the dean and precentor in St. Patrick's Cathedral, Dublin, and in the old cathedral was on the eastern side of the whole of the prebendal stalls. This device is said to be traceable to King John's connection with the cathedral, that monarch, as well as his successor Henry III, having adopted the royal badge assumed by Richard Cœur-de-Lion and which, according to some authorities, represented the Star of Bethlehem between the horns of the Mussulman crescent. Thus we find the star and crescent on King John's Irish coinage. A peculiar ornament representing the crescent and star in a different context was dug up in Dublin in 1884 and may possibly date from the days of King John. From its appearance it evidently was intended to be hung to some trapping or other, very likely in combination with many others of a similar pattern and altogether it is very reminiscent of the "ornaments like the moon" that the Midianites long, long ago hung round their camels' necks as related in the Book of Judges.

THE KAISER'S SILVER FLOTILLA AT THE BERLIN SHIPBUILDING EXHIBITION.

Berlin is to have an exhibition illustrative of the art of shipbuilding. The German Emperor, who is greatly interested in the enterprise, will be an exhibitor. The Emperor's exhibit will consist of fifteen solid silver models of ships and yachts and a number of sailing prizes won by him. Each of the models exhibited represents a definite type of sailing craft of past centuries. A viking's war barge, dating from about 900, is the oldest. The craft that it was patterned after was 95 feet long and 16½ feet wide, was of 50 tons displacement, had a sail surface of 70 square meters, and her complement was 80 men. The model coming next in age is a Norman ship of the twelfth or thirteenth century and of almost twice the above magnitude. Then there is a galley, from the Mediterranean, a Hanseatic "cog," a Hamburg convoy ship, and the English man-of-war, "Great Harry," of the thirteenth to sixteenth century era. Germans will be particularly interested in the model of the first important Brandenburg-Prussian war frigate, bearing the imposing name of "Mounted Prince-Elector Frederick William." This model weighs upward of 58 pounds, and was a silver-wedding present to the Emperor from the Shipbuilding Society on February 27, 1906. Not less interesting is the model of the most famous of sailing ships, the "Victory," the flagship of Admiral Lord Nelson, on which this naval hero met his death in the moment of victory at the battle of Trafalgar, October 21, 1805. A model of the schoolship "Grossherzogin Elizabeth" represents the modern sailing type of the twentieth century. Four other models show the "Welle," "Romet," "Iduna," and "Meteor," sailing yachts. There is also a model of a Chinese war junk, a present from Prince Henry, and a lifeboat of the German Life-Saving Society, with complete regulation outfit, which completes the collection.

OFFICIAL METEOROLOGICAL SUMMARY, NEW YORK, N. Y., JUNE, 1908.

Atmospheric pressure: Highest, 30.38; lowest, 29.81; mean, 30.04. Temperature: Highest, 93; date, 24th; lowest, 56; date, 3d; mean of warmest day, 80.5; date, 24th; coolest day, 64; date, 3d; mean of max. for the month, 80.2; mean of min., 63.0; absolute mean, 71.6; normal, 69; excess compared with mean of 38 years, + 2.6. Warmest mean temperature of June, 72, in 1888, 1892, 1899, 1906. Coldest mean, 64, in 1881, 1895. Absolute max. and min. for this month for 38 years, 97 and 45. Average daily excess since January 1, + 1.5. Precipitation: 1.70; greatest in 24 hours, 1.63; date, 15th and 16th; average of this month for 38 years, 3.21. Deficiency, —1.51. Accumulated excess since January 1, + 2.52. Greatest June precipitation, 7.70, in 1887; least, 0.86, in 1894. Wind: Prevailing direction, south; total movement, 6,852 miles; average hourly velocity, 9.5 miles; max. velocity, 42 miles per hour. Weather: Clear days, 13; partly cloudy, 15; cloudy, 2; on which 0.01 inch or more of precipitation occurred, 6. Thunderstorms, 15th, 23d, 24th, 29th.

THE CURRENT SUPPLEMENT.

The current Supplement, No. 1697, opens with an illustrated article on the South African stope drill competition, which will net the two winners $20,000 and $5,000, respectively. Prof. C. V. Boys explains the theory of Diabolo. In the twenty-first installment of his "Elements of Electrical Engineering," Prof. A. E. Watson discusses protective apparatus. With the object of illustrating in a condensed form the value of tar as a by-product to both the gas and coke industries, Carroll Miller gives a *résumé* of the many products which can be manufactured from coal tar. Moving pictures have conquered the theaters of the world. For a few cents one can witness miracles. How these miracles are performed is entertainingly set forth in an instructive article by Gustave Babin, with the help of many amusing pictures. A cooling installation for hot countries is described by Dr. Gradenwitz. Our Paris correspondent concludes his article on Korn's new telephotographic system.

NO AWARD OF THE PRIZE FOR HUMANE SLAUGHTERING.

No award will be made for some time in the competition for a humane slaughtering device for which a prize of $500 was offered by the American Society for the Prevention of Cruelty to Animals. Of the numerous inventions submitted in the competition, none came within the exact provisions of the competition. A large consignment of new inventions is expected from Europe in a few days, and will be given a complete and careful trial before a final report is published.

Some progress has been made from the very fact that general attention has been directed to the subject, and the committee hopes within a short time to determine which, if any, of the inventors is entitled to the $500.

The competition was instituted by the A. S. P. C. A. in these words: "Painfully conscious of the cruelties inflicted upon animals by the present methods of slaughtering, and desirous of preventing, as far as possible, the sufferings of animals at the moment of giving up their lives for the benefit of mankind, the American Society for the Prevention of Cruelty to Animals, through its board of managers, offers a reward of $500 for the device or apparatus not now in use which will best accomplish the humane destruction of animals for food purposes."

As a result a great number of models and drawings were submitted prior to June 1, on which date the entries were closed.

Some years ago a German woman offered a reward of $3,000 for the best method of killing food animals, and this had proved a great stimulus to invention. Then the German government undertook the supervision of all abattoirs, as the American government has since done, appointing specialists of distinction to various posts created for safeguarding both humanity and the dumb creatures, taking the advice of skilled veterinarians, and compelling the strictest observance of the laws enacted to govern abattoirs. Among other inventions the "Behr pistol" was brought forth as an instrument for quick and humane destruction, and this weapon is now generally employed throughout the German empire.

In France, where government supervision is now equally strict, what is called the "Bruneau mask" is placed over the head of the animal to be slain, buckled behind the ears, and a blow from a mallet drives a chisel held in the mask into the animal's brain, causing instant and painless death.

In Spain the spine of the animal is severed with the thrust of a spear, and this is the method in Cuba and other Spanish speaking countries, except that a dagger is sometimes substituted for the spear.

In Great Britain, where the matter of a reform in abattoir methods was agitated some years ago by the Royal Humane Society, an admiralty commission was appointed to make an investigation, and in due time this commission reported in favor of the pole ax, which is also employed in Austria-Hungary.

In no other country on earth which makes a pretense of civilization do such methods as those now in use in America prevail.

An amazing variety was shown in the devices submitted in this competition. The guillotine idea had obsessed many of the inventors, but it was adapted to the use of the abattoirs in several instances with great ingenuity. Rapidity is a prime essential in the big packing houses. The guillotine is not fast enough.

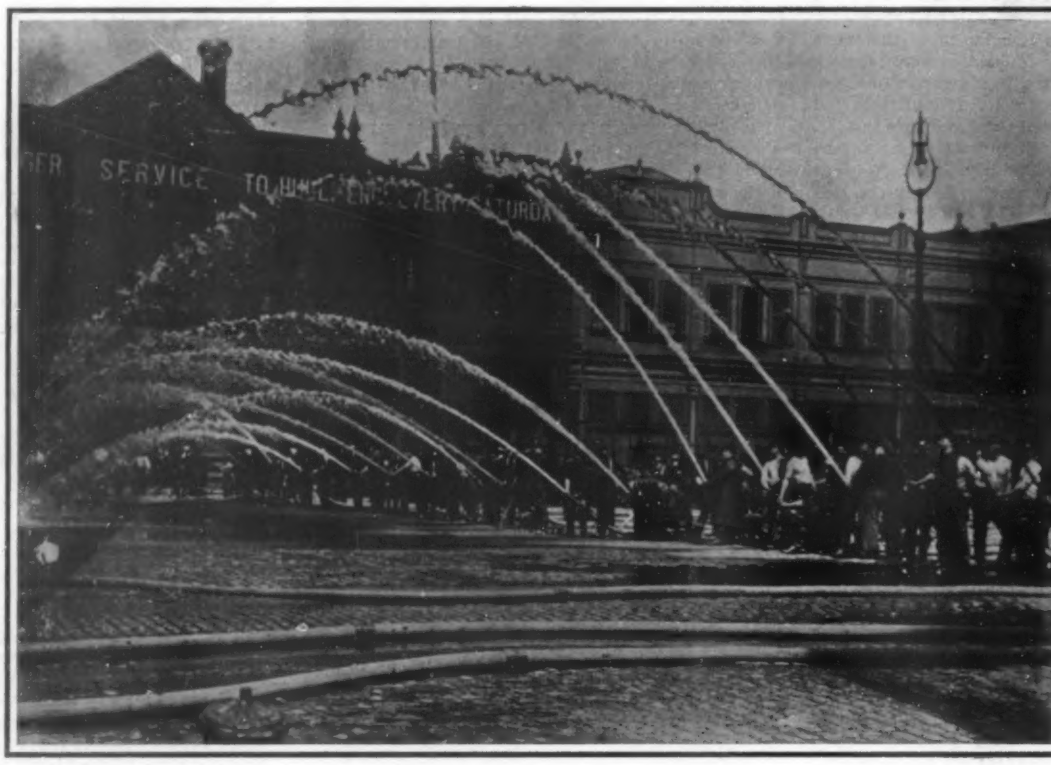
Aeronautical Notes.

The new Bleriot monoplane at its first trial on June 29, made a flight of 600 meters (1,968 feet).

After remaining 6¾ hours in the air during its second test on June 29, the new airship "Zeppelin IV." two days later made its first real voyage. On this occasion, starting out at 8:30 A. M. from its floating shed on Lake Constance at Friedrichshaven, the airship rose to a height of about 1,000 feet and laid its course for Zurich, passing over Constance, Frauenfeld, and Winterthur. At Zurich it circled around the cathedral, and then turned southward toward Lucerne, which was reached at 12:30. After performing a series of evolutions above Lake Lucerne, the airship made a circuit of it and then, heading northward, started on its return journey. Lake Constance was reached again at 6:30 P. M., and then the dirigible made a trip to Bregenz in Austria-Hungary. Upon its return to Friedrichshaven it executed various evolutions above the town and descended to within 100 feet of the roofs of the houses. The voyage lasted 12 hours, and the distance covered was about 248 miles. The airship developed a speed of 34 miles an hour. Its greatest elevation was 2,460 feet. Count Zeppelin expects to make a 24-hour voyage to Mayence and back soon. Upon the making of this trip depends the purchase of the airship by Germany for $500,000.

SUCCESSFUL TEST OF NEW YORK'S NEW HIGH-PRESSURE FIRE SERVICE.

The first test of the new high-pressure fire service in New York city demonstrated completely the success of the system, and at the same time it must be considered not only as marking an important epoch in the fire protection of the city of New York, but as a turning point in the methods of fire-fighting in American cities. In recent years New York has presented to insurance underwriters a grave problem, and despite the excellent fire department its exposure to the dangers of a general conflagration have been fully realized. Indeed, it has been considered that in view of the concentration of industrial establishments and tenements, the lower part of New York city possesses the most congested risks known in all insurance engineering, while it is only comparatively recently that adequate building regulations have demanded sufficient fireproof construction. The result is that there are to be found many buildings and warehouses filled with goods of practically inconceivable value and located on streets narrow and ill-arranged. Amid modern fireproof or fire-resisting structures are scattered vast numbers of old and easily combustible buildings, which are not only dangerous in themselves but are a great peril to the more or less fireproof buildings in their neighborhood. Added to this until recently there was an inadequate supply of water, distributed through a system of mains long overtaxed and out of date and at a pressure insufficient for satisfactory service.



Testing New York's High-Pressure Fire Service.

To remedy the inadequate water supply and distribution system there has been installed a high-pressure independent fire main service along the general lines of a system in successful use in Philadelphia since 1904, but on a far more extensive scale and with many improvements. The new system has been designed to protect the most congested and most hazardous part of Manhattan Island, the "Dry Goods District," which extends from the City Hall to 25th Street and from the North River to Second Avenue and East Broadway. It involves in addition to two pumping stations new extra heavy mains with improved valves and hydrants. The mains, which aggregate nearly 63 miles in length, vary in diameter from 12 to 24 inches and are laid with such gridironing and cross-connection throughout the district that there is the fullest circulation of water.

The 24-inch mains practically surround the entire district, and the parallel and intersecting mains are also of large diameter. The cast-iron pipes and the valves were tested at the shops up to 600 pounds hydrostatic pressure, and after being laid in the streets were required to withstand a test pressure of 450 pounds. The hydrants required for the system naturally have been made especially heavy and are provided with four nozzles, one $4\frac{1}{2}$ inches in diameter and the others 3 inches. The placing of these hydrants so that each should be fed by mains of large size received particular attention, as this has been a great defect in New York's water system. In the high-pressure service there is always a hydrant within 400 feet of any building in the protected district and hydrants in sufficient numbers so that if any single block were on fire 60 streams of water, each delivering 500 gallons per minute, could be readily concentrated on that block. This would be equivalent to the capacity of 120 fire engines each rated at 250 gallons per minute. In other words, there could be concentrated on any fire in the protected district a greater volume of water than could be pumped by all the fire engines on Manhattan Island.

It should be clearly understood that the water ordinarily used in the high-pressure mains is fresh Croton water from the city reservoirs, and not salt or river water, as is often supposed, though both stations are located near the river front and have large intakes through which salt water can be drawn in case of failure of the fresh-water supply or any extreme emergency such as a general conflagration. With an adequate supply of water assured by large and direct mains from reservoirs to the stations and from the mains, the next feature is the pumping machinery. In low, one-story brick-and-steel fireproof buildings are contained three-phase electric motors direct connected to centrifugal pumps, which are always ready to operate at a moment's notice. The stations are two in number, one being located on the East River at Oliver and South Streets and the other at Gansevoort and West Streets near the North River, both locations having been selected for being outside the district of high fire risk. Both stations are essentially similar as regards design and equipment, each containing at present five pumping units with space for three more.

In the plant at Philadelphia gas engines were used to drive reciprocating or plunger pumps and the same practice was followed in the high-pressure fire system installed at Coney Island in 1905, but later, for the two high-pressure pumping plants in Brooklyn, it was determined to employ rotary or centrifugal pumps, as their efficiency by that time had been amply demonstrated. With this type of pump it was desirable to use electric motors, as it was found that power supply stations had become so well organized and equipped as to insure a constant supply of current at any time it was desired. For the same reasons this general form of installation was adopted for the Manhattan stations, and in the tests so far made has met all the requirements. At the Manhattan high-pressure stations current is always available and the supply so amply protected that failure is practically impossible. Both stations maintain direct connection with the Waterside or main generating station of the Edison Company by two 250,000 circular mils, three-phase cables laid in ducts, while there are independent reserve feeder cables from the sub-stations of the Edison Company, and in addition facilities are provided for connecting with the supply of the Brooklyn Edison companies. As a last reserve it may be mentioned that the mains on the river front are laid to the pier ends, where connections can be made with any or all of the fire-boats, five of which have a combined pumping capacity of 40,000 gallons per minute at 150 pounds pressure.

Twenty-four Streams with a Capacity of Over 18,000 Gallons per Minute.

SUCCESSFUL TEST OF NEW YORK'S NEW HIGH-PRESSURE FIRE SERVICE.

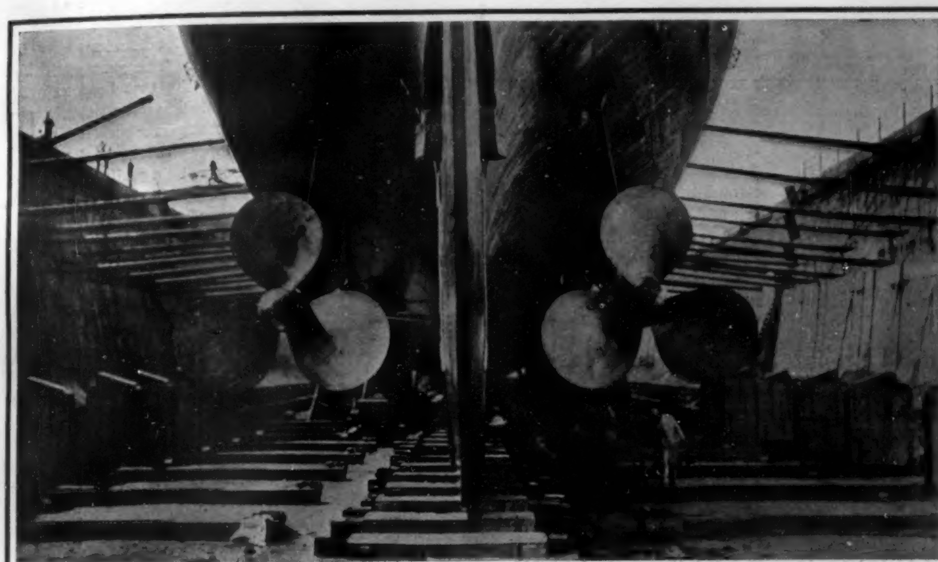
The motors and (*Continued on page 30.*)

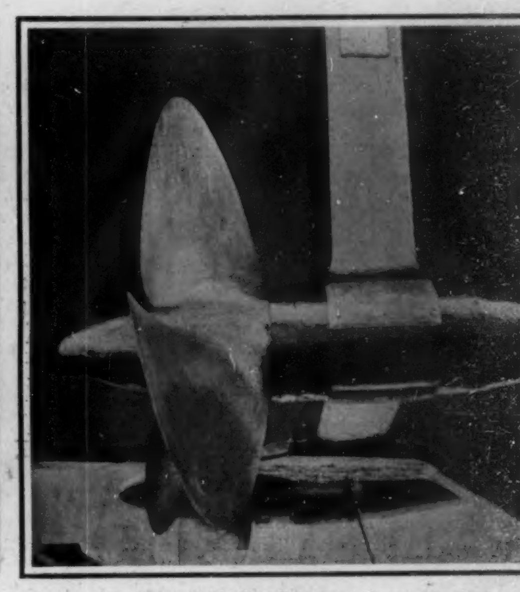
THE TRIALS OF THE SCOUT CRUISER "SALEM."

Few events of recent years have attracted more attention among marine engineers, and particularly those of the navy, than the trials of the scout cruiser "Salem," recently completed at the Fore River Works. This is due to the fact that she is equipped with American turbines of the Curtis type, and that in these trials, for the first time, this type has had an opportunity to be tried out under the results obtained in the more recent tests of the "Salem."

The "Salem" being a purely scouting vessel, everything in her design has been subordinated to speed and coal endurance. She measures 420 feet between perpendiculars, 47 feet 1 inch in breadth at the waterline, and has an official normal displacement on a draft of 16 feet 9 inches of 3,750 tons, and a full-load displacement of 4,687 tons. She has two masts and sections flare rapidly above the waterline, and the "Birmingham" has already shown herself to be capable of steaming against a heavy sea without taking any considerable amount of water aboard.

The beauty of the under-water model of these ships, and the excellent results obtained in the recent trials, are a tribute to the excellent work now being done at the model tank at Washington, under Naval Constructor D. W. Taylor. Although at full-load displacement





These propellers showed the remarkable propulsive efficiency (for a turbine-driven ship) of 62.8 per cent. They were selected in competition with three other designs, by the Navy Department, Denny of Scotland, and the Vulcan Works, Germany, the last-named designs showing 50 and 54 per cent. efficiency.

Astern and Side View of the Propellers of the 26.8-Knot Scout Cruiser "Salem."

equal conditions against the Parsons turbines, and also against reciprocating marine engines of the standard type. The opportunity for this comparison was afforded by the construction for the United States navy of three fast scout cruisers, which are identical in everything except their motive power. The "Birmingham" is driven by reciprocating engines, and the "Chester" and "Salem," respectively by Parsons and Curtis turbines. The trials in each case consisted of standardization runs over a measured-mile course; a full-power run for four hours; a 24-hour run at 22½ knots, and a 24-hour run at a cruising speed of 12 knots. The details of the trials of the "Birmingham" and the "Chester" have already been published in earlier issues of the SCIENTIFIC AMERICAN, and below we give a digest of these trials for comparison with

COMPARATIVE TRIALS OF SCOUT CRUISERS.

	"Birmingham."	"Chester."	"Salem."
I. STANDARDIZATION TRIALS, ONE-MILE RUNS.			
Fastest run on course	25.34	26.22	26.88
Mean of five fastest runs	24.50	25.07	25.95
Revolutions per minute	202	550	378
II. FULL-SPEED FOUR-HOUR RUN.			
Mean speed	24.32	26.52*	25.94
Coal per hour, pounds	29,904	38,382	38,508
Miles per ton of coal	1.82	1.54	1.51
III. TWELVE-KNOT, TWENTY-FOUR-HOUR RUN.			
Mean speed	12.22	12.2	11.98
Coal per hour, pounds	4,629	4,091	4,051
Miles per ton of coal	5.96	6.68	6.60

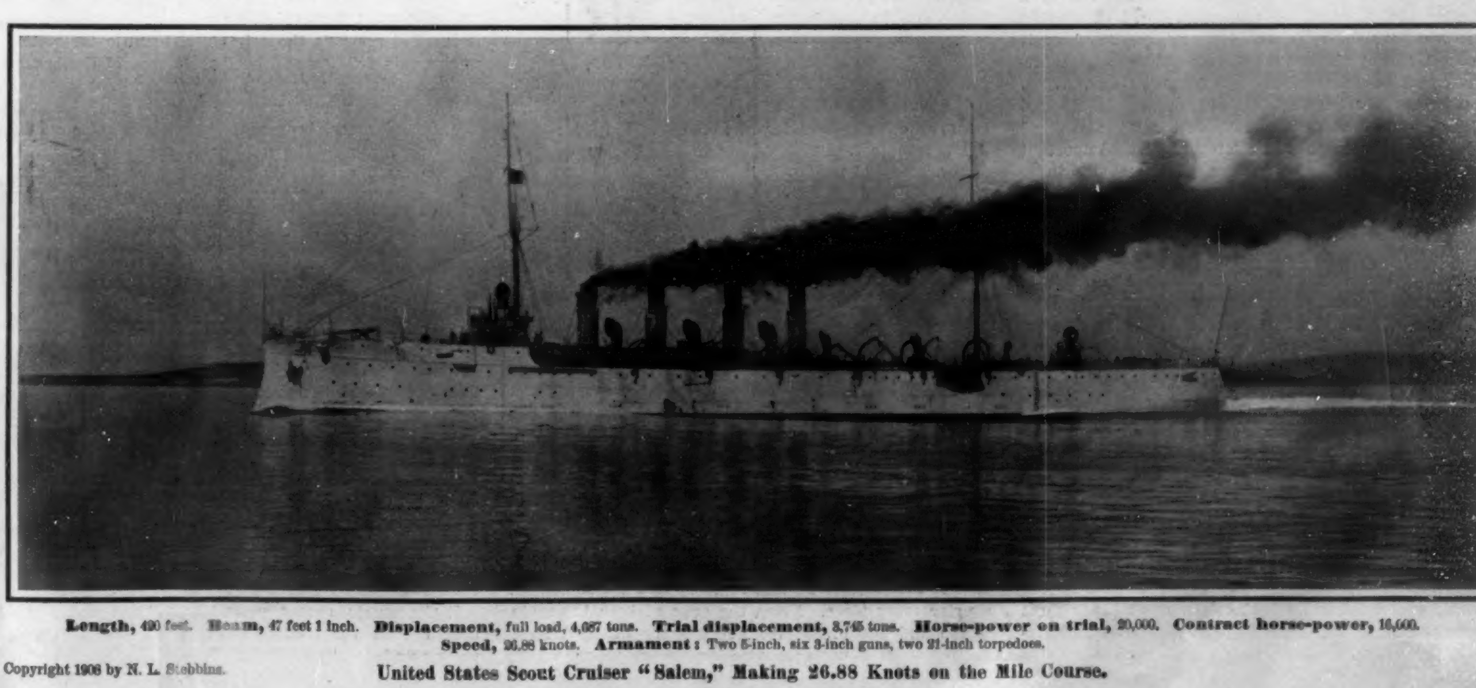
* Estimated and probably too high. Propellers standardized only to 25.07 knots, and slip increasing at higher speeds.

four funnels, and carries a light armament of two 5-inch and six 3-inch rapid-fire guns. She is also provided with two 21-inch submerged torpedo tubes; though what in the world she is provided with these for, we are at a loss to imagine. Also it is difficult to understand why she has been given a waterline belt of 2 inches of nickel steel. Had the weight of this armor, which will act merely as a shell exploder, and the weight and space of the torpedo rooms been devoted to coal, the radius of action of the ships would have been increased possibly thirty per cent without the least impairment of their efficiency. However, if we except side armor and the torpedo rooms, the "Salem" and her sisters must be considered highly creditable designs, and greatly superior to the "Attentive" class of scouts in the British navy, as the accompanying tabular comparison clearly shows. An

	Length.	Beam.	Speed.	Draft.	Displacement.	Max. Coal.	Freeboard.
	Feet.	Feet.	Kts.	Feet.	Tons.	Tons.	Feet.
"Attentive"	374	38¼	25 5	18¼	2,670	380	12 and 20
"Salem"	420	47	26	16¾	3,750	1,250	22 and 30

excellent feature is the high freeboard, which is about 22 feet amidships and 30 feet forward. Although the lines at the bow are extremely fine, the horizontal and fully equipped for a cruise these vessels will not displace far short of 5,000 tons, their model is as fine as that of a torpedo-boat destroyer. As a matter of fact, their coefficient of fineness is 48 per cent as compared with the coefficient of 60 to 63, which is not uncommon for a transatlantic liner. An indication of the fineness of the lines is shown in the accompanying photograph, taken when the "Salem" was running just under 27 knots. The bow wave is thrown off so gently that it barely breaks abreast of the foremast. This illustration makes an interesting comparison with those of several of our battleships which were given in our issue of June 13, in which the enormous bow waves thrown off by the bluffer bows of the battleship are shown with striking effect.

But the interest in these trials centers, as we have already said, in the motive power, and the determination of how far the Curtis turbine will compare in all-around efficiency with the well-tried turbines of the Parsons type. The results show that on all points of comparison it is at least as good, and in several points decidedly superior. The speed on the series of standardization runs over the measured mile was nearly a knot better; the coal consumption was practically the same; and in regard to vibration, the "Salem" was immeasurably superior, the characteristic high-frequency, lateral, vibration of the Parsons-driven ships being very marked on the "Chester"; whereas, when the "Salem" was running at 26 knots and over,



Length, 420 feet. **Beam,** 47 feet 1 inch. **Displacement,** full load, 4,687 tons. **Trial displacement,** 3,745 tons. **Horse-power on trial,** 20,000. **Contract horse-power,** 16,000. **Speed,** 26.88 knots. **Armament:** Two 5-inch, six 3-inch guns, two 21-inch torpedoes.

Copyright 1908 by N. L. Stebbins.

United States Scout Cruiser "Salem," Making 26.88 Knots on the Mile Course.

THE TRIALS OF THE SCOUT CRUISER "SALEM."

there was practically no vibration, even at the stern, and absolutely none forward and amidships—a fact which called forth enthusiastic comment from the seagoing officers who were aboard during the trial.

The advantages claimed for the American type of turbine, as clearly brought out in these trials, are that because they admit of a slower speed of rotation, and the use of larger propellers, it becomes possible to develop the power in two turbines working on two shafts; that it is possible with these two turbines to operate economically both at high speed and at low cruising speed; that a larger percentage of the total power can be developed when going astern; and, finally, that because of the simplicity and compactness of the plant, only from sixty to seventy per cent as much engine space is required as is necessary to secure the same results with Parsons turbines.

The engine room of the "Chester" contains six turbines, operating on four shafts. When going ahead, steam is admitted to two high-pressure turbines, exhausts from them into two low-pressure turbines, and then passes to the two condensers. It has been found impossible to run a Parsons equipment of this kind economically at the slow speed of from 10 to 12 knots, at which most of the cruising of naval vessels is done, and in order to reduce the coal consumption to a reasonable figure, it has been found necessary to provide a pair of cruising turbines, which, in the "Chester," are mounted forward of the low-pressure turbines and upon the same shafts. When cruising, steam is led from the boiler to the cruising turbines; from them to the high-pressure, from the high-pressure to the low-pressure turbines, and from them to the condensers. With this arrangement the "Chester" showed a better economy at cruising speed than the "Birmingham"; but the arrangement is subject to the disadvantage that two extra units have to be employed, which ordinarily are idle; and, as we have before mentioned, proportionately larger engine-room space is required. The Curtis turbines, as installed on the "Salem," however, have the advantage that the steam, always at high pressure, is fed through a series of nozzles placed around the circumference of the casing, and that the power is reduced by simply closing down the proper number of nozzles. The advantages of the Curtis system are clearly stated in the following extract from an article entitled "Experience with Marine Turbines" in the 1908 issue of Brassey's "Naval Annual": "At full load, and for turbines of large size, the Parsons system has undoubted advantages, but when it is desired to reduce the ship's speed, there is nothing corresponding to the adoption of earlier cut-off in the piston engine. The only alternative is to reduce the pressure of the steam by throttling it, and in this way some of the advantage of the expansive property of high-pressure steam—and, therefore, some measure of economy—is forfeited. The Curtis turbine has, perhaps, some advantages in this respect. The change from kinetic energy to work is achieved by the 'impulse' due to jets of steam acting upon blades formed on 'wheels' mounted on the shaft to be rotated. The steam expands in a number of sets of nozzles or pressure 'stages' successively from the high-pressure to the exhaust end of the turbine. Thus, after expanding in the nozzles of the first 'stage,' the steam issues in jets against the first row of buckets on the rotating wheel, a large part of the energy being absorbed. It then flows to a row of stationary vanes, which guide the steam into a second row of moving buckets. These may be followed by a second set of fixed vanes and a third set of moving ones, after which the steam leaves the 'stage,' as it is called, through a second set of nozzles, where further expansion takes place, again generating velocity. From these nozzles it flows once more in sinuous fashion through successive sets of moving and fixed blades, and thence to other 'stages.' The important point to note is that expansion of the steam takes place only in the nozzles, and not in either the fixed or moving blades. Hence the pressure of the steam does not alter between one set of nozzles and the next. At the low-pressure end the nozzles cover the whole periphery of the wheel, but at the high-pressure end they extend only over an arc often not more than one-eighth of the whole circumference. It is thus possible to reduce the power of the turbine by cutting out a proportion of the total number of nozzles, instead of by reducing the pressure of the steam supplied by throttling it at the valve. Thus, whereas in the Parsons system cruising turbines are fitted to attain reasonable economy at low speeds, they are unnecessary with the Curtis system."

Intimately associated with the success of a turbine equipment is the propeller question. From the very first, the propeller has been at loggerheads with the turbine, the former requiring moderate speeds of revolution for the best results, and the latter, particularly the Parsons type, giving its best efficiency at the highest speeds of revolution. This is particularly true of vessels of large displacement; and it has become necessary to effect a compromise, so that in the latest ships, such as the "Lusitania" and "Mauretania," the propellers are smaller and are run faster, and the turbines are larger and are run slower, than is desirable for the best economy. No such difficulty is experienced with the reciprocating engine, where large-diameter propellers and slow speeds of revolution may be adopted without reducing the efficiency of the engines. The Curtis turbine occupies a middle position between the high-speed Parsons and the low-speed reciprocating engine; and, because of the moderate speed of revolution and the fact that the power can be developed upon two instead of four shafts, it has become possible to secure a high propeller efficiency. The efficiency of the propellers of the "Lusitania" was given by Mr. Bell, the designer, in a recent paper read in London, as only 48 per cent. The propeller efficiency of the "Salem" rose from 55 per cent at 12 knots to a maximum of 62.8 per cent at the contract speed of 24 knots, then fell, with the increase of slip, to 62.4 per cent at 25 knots and 59.4 per cent at 26 knots. This is a remarkable result for a turbine equipment, and comes pretty near to the efficiency of the propellers of the crack German liners, which have shown as high as 67 and 68 per cent. The present propellers were adopted after a series of trial runs with four different designs of propellers; one by the Navy Department; another by the Denny firm, Scotland; a third by the Vulcan Works, Germany; and the fourth by the Fore River Company. The government design broke down through excessive cavitation early in the trials. The Denny propellers showed 50 per cent efficiency at 24 knots, the Vulcan 54.04 per cent at 24 knots, and the Fore River type, which was designed by the Chief Engineer, Mr. Charles T. Edwards, showed 62.7 per cent at 24.5 knots. We present two illustrations of these propellers, which are 9 feet 6 inches diameter with a pitch of 8 feet 8 inches, that will possess strong interest in connection with these comparative figures.

The standardization trials held to determine the number of revolutions of the propellers corresponding to various speeds, from 12 knots to the highest speeds of the vessels, took place off Rockland in from 40 to 60 fathoms of water. The start and end of the mile are marked by pairs of posts set up on shore, and the time is taken from the bridge from the moment that the first pair come in line to the instant that the finish line is crossed. Meanwhile, the revolutions of the engines are accurately recorded by a mechanical counter. The effect of the tide, whose velocity is measured by a government vessel stationed at the center of the course, is eliminated by making the alternate runs with and against the tide. The "Salem" made five runs over the course, the fastest, with a favorable tide of 0.8 of a knot, showing a speed of 26.88 knots an hour, and the mean of all five runs working out at 25.957 knots. The mean displacement during the runs was 3,745 tons. On the fastest run of 26.88 knots, the propellers made 382.4 revolutions per minute. The steam pressure at the steam chest on the turbines was 253 pounds. The peripheral speed of the blades, at the above speed, was 1,200 feet per minute, and the horsepower was 20,200, or over 25 per cent more than was required by contract. It was estimated that the ship would make 24 knots with sixteen nozzles open on the turbines; but she actually made 25.4 knots under these conditions, and 26.88 knots with the full number, twenty, open. The coal used on these trials was a screened Pocahontas.

In the starting and stopping trials the engines went from full speed ahead to full speed astern in 1 minute and 30 seconds, and from full speed astern (at which they develop 70 per cent of the full speed ahead power) to full speed ahead in 1 minute and 4 seconds.

EXPERIMENTS WITH A HELICOPTER.

BY OTTO G. LUYTIES.

The purpose of the experiments here described has been to collect data for the construction of rotary flying machines.

For practical purposes, it was thought desirable to make preliminary tests on a full-size model, particularly as the best proportions appear to vary greatly with the diameter. The experimental machine is mounted on springs of known tension, the lift in pounds being ascertained by measuring the increase in the height of the springs.

The rotating surfaces are made of light canvas stretched between steel tubing. They are 35 feet in diameter, and have a total area of about 850 square feet. In the test here recorded they were set at an angle of 12 degrees with the horizontal for the upper blades and 13 degrees for the lower, and allowed to assume a slightly concave form.

The revolving blades are attached to concentric hollow steel shafts rotated in opposite directions by two bevel gears driven by one pinion. The bevel gears are held in an inverted yoke bolted to a piece of light channel iron, which forms the main longitudinal portion of the frame. To this there is bolted a somewhat shorter cross piece. From the ends of both the main frame and the cross piece, rods made of light steel tubing extend upward, meeting in a collar which forms a support for the vertical shafts. This support as well as the upper thrust bearing of each of the two main shafts is fitted with ball bearings. The friction is so moderate that the machine can be turned slowly by hand.

The entire apparatus, which weighs a trifle over 1,000 pounds, is arranged to rest upon carriage springs, of which four were used at first and later three. The springs are connected at the bottom by a frame of light angle iron. The deflection of the four springs shown in the photograph was 220 pounds to the inch.

The main pinion is driven by the eight-cylinder air-cooled motor through spur gears, a single reduction having been used at first, and later increased by the addition of a small countershaft. The gear ratio last used was one to fifty. During the test here referred to the propellers made 31 revolutions per minute, and the motor 1,550. A brake test made after this experiment showed that the motor gave 20 brake horsepower at this speed, the motor being slightly out of order. The vertical lift was approximately 700 pounds, or 35 pounds to the horse-power.

The experiments were greatly hampered by the wind, which wrecked the machine on several occasions, causing continual delay and expensive repairs. The construction was commenced in the spring of 1907. There was a long wait for the motor, which unfortunately broke down during the first trial in October, and had to be returned to the factory for repairs. Experiments were resumed on its return, the photographs being taken on December 19 and 28, 1907, the maximum lift obtained at that time being 550 pounds. The lifting test of 700 pounds here referred to was made during the first week of April, 1908. Another windstorm again stopped the experiments, which have been discontinued for the present for lack of available funds.

Making use of the information obtained from these experiments, the writer has designed a machine weighing about 700 pounds, and which should be capable of lifting about 1,100 pounds, or 400 in excess of its own weight, with 40 brake horse-power. The construction of this practical machine will be commenced whenever all the conditions permit.

In the meantime the following suggestions are submitted for the consideration and use of experimenters interested in the helicopter type of flying machine. They are based partly upon theory and partly upon these experiments.

The author recommends the use of: 1. Very large areas. 2. Slow rotation. 3. Moderate, uniform angles. 4. Four-bladed propellers. 5. Concentric shafts. 6. Progression by inclination.

1. The obtainable lift per horse-power increases slightly with the area, approximately with its cube root. The author strongly urges the use of very large areas for helicopters as a means of securing high efficiency combined with reasonable safety in case of accident to the motor. From one-quarter to one pound per square foot appears to be advantageous, although these large areas are comparatively difficult to construct and handle.

2. The lift per horse-power varies inversely as the speed if the angle be fixed. This is simply because horse-power is foot pounds, and the less the linear speed per minute with any given horse-power, the larger the obtainable thrust and lift. Skin friction and head resistance of bracing and wiring are also relatively least at the lowest speeds. A linear velocity of about forty miles an hour for the center of pressure of the blades should be about sufficient for present use.

3. The smallest possible angle of incidence is theoretically most favorable. In practice it appears that about 5 degrees is the minimum, because for smaller angles skin friction and head resistance of the bracing become relatively excessive. Large blades made of silk or canvas require still larger angles, such as about 10 degrees, because it is practically impossible to stretch the fabric sufficiently to prevent flapping and to obtain a proper curvature if the angle is small.

The reason for suggesting approximately uniform angle rather than uniform pitch, as in a helix, is that high thrust is desired rather than high efficiency as a vertical propeller. Although uniform pitch is correct for a screw progressing rapidly along its axis, it is not desirable for a slowly-rising thrusting screw, as it gives surfaces that are too steep for a good thrust near the center of the shaft. The maximum thrust per given area is reached when the angle approaches 40 degrees, and the maximum thrust per horse-power in a large helicopter is reached with 5 or 10 degrees, with possibly a trifle more near the center.

4. Four-bladed propellers were found preferable to two-bladed for purely structural reasons. It is very difficult to brace large two-bladed propellers properly, whereas the four-bladed kind can be conveniently braced by diagonal wires between the blades. It is believed that the loss in lift per horse-power is more than balanced by increased strength.

5. Concentric shafts permit of strong and simple design even for large diameters, and are therefore recommended. The lift of superposed rotating surfaces seems to be somewhat less than for the same surfaces on separate shafts, but the actual interfer-

ence of air currents does not appear to be prohibitive, even large blades passing in the air without excessive shock.

6. Progression by inclination of the shafts, or even of the whole machine, is recommended on account of its simplicity. It is interesting to note the unexpectedly high horizontal velocity obtainable by a slight inclination of the shafts if the writer's new theory is substantiated. It is also interesting to observe that the sum of the vertical thrust and horizontal thrust obtainable with a given horse-power is larger when exerted diagonally upward along one axis than if divided between one upward and one forward propeller. This is due to the fact that in the triangle of the resolution of forces, two sides are longer than the hypotenuse, provided that, in this case, little or no vertical motion takes place along the vertical side. Although a given horse-power cannot be divided into components totaling more than itself, a given thrust may be so divided, provided the motion is limited and determined.

Judging from these experiments and from theory, the author believes the following lifts per horse-power to be obtainable in actual practice, using small angles and large areas, such as one square foot for each pound and not more horse-power than is required in each instance:

	Pounds.
Narrow two-bladed fans, separate shafts	40 to 60
Wide four-bladed fans, separate shafts	30 to 40
Narrow two-bladed fans, concentric shafts	30 to 50
Wide four-bladed fans, concentric shafts	25 to 35

It should be remembered that the last type is recommended for its structural advantage in spite of its lesser lift per horse-power.

In later practice, if reliable high-weight motors are obtainable, it will undoubtedly be found preferable to use somewhat smaller areas, as large areas are so difficult to construct and handle. It will be convenient to remember that one-quarter of the area with double the speed will give the same lift with the same angle, but that a trifle over twice the horse-power is required.

The advantages of the helicopter over the aeroplane, as the author sees them, are presented in the current SUPPLEMENT.

Success of Our Wanted-to-Buy Column.

Each day our mail brings us numerous inquiries for articles of all kinds, from the smallest novelty to the complicated machinery used in manifold industries. Where the article is advertised in the SCIENTIFIC AMERICAN, it is of course easy to find the same by a reference to our handy Manufacturers' Index, which has just been issued for free distribution, but there are many cases, however, where we are unable to give the address wanted. We then enter the correspondent's name and address in a book and give his inquiry a number. The inquiry is then published in the Classified Advertising Column, being interspersed with the classified advertisements. Manufacturers see these inquiries, and write us for the name and address of the correspondent, which is given. Thus buyer and seller are brought into business relations, we merely acting as a clearing house for our readers. There is no expense connected with this service, but it should be thoroughly understood that the free inquiries are only for buyers; the advertising columns are always open for sellers. Our readers are requested to avail themselves of this opportunity. Since we have started this column the number of inquiries has swelled in volume to over one hundred weekly so we feel that it is of real service to our readers.

Peary Ready for His Polar Expedition.

Commander Robert E. Peary has announced that the "Roosevelt" will probably be on her way north by the time this number of the SCIENTIFIC AMERICAN is printed.

Every obstacle to the expedition has at last been overcome. The "Roosevelt" is bound for Sydney, Cape Breton, the first stage of the expedition. She will be gone two years. All of the $50,000 needed fully to equip the ship for such a voyage has not been raised, but only about $5,000 is lacking now. The largest gift received was $15,000, but many small gifts have been received, down to $10, with letters that made them as acceptable and as much appreciated as if the sum had been thousands.

Commander Peary himself will go to Sydney by rail, joining the "Roosevelt" there. The vessel will be coaled at Sydney, though the real stocking of the ship's larder for two years and more has been done here.

The ship's supplies include 160 cases, or 16,000 pounds, of flour; 1,000 pounds of coffee, 800 pounds of tea, 10,000 pounds of sugar, 400 cases of kerosene oil, about 2,500 gallons; 7,000 pounds of bacon, 400 cases of biscuit, or 10,000 pounds; 100 cases of condensed milk, 50 cases of roast beef hash, 30,000 pounds of pemmican, 3,000 pounds of dried fish, and 1,000 pounds of smoking tobacco. Game and other meats will be obtained in the Arctic regions.

GOVERNMENT TESTS OF MINE EXPLOSIVES.

Plans for a government experimental station, to be devoted to the testing of explosives used in coal mining, have been perfected by the Technologic Branch of the United States Geological Survey. The station is to be erected at a point in one of the large coal districts, the exact site not having yet been selected.

This line of investigation is one of several recently entered upon by the government in pursuance of its determination to reduce the waste of the fuel resources of the United States. The use of improper explosives in coal mining, as well as the improper use of suitable explosives, results annually in the waste or destruction of great amounts of coal. The use of too high charges in blasting or the use of unnecessarily violent explosives shatters much good fuel, converting some even into dust, which is itself explosive, and may thus be productive of further damage. Such explosions often loosen the roof of a coal mine, which may fall later, to be thus wasted, or productive of fatal accidents.

In addition to conducting experiments on explosives in a testing laboratory, the Geological Survey will carry on actual experiments in mines, with a view of determining methods of reducing waste of fuels in mining operations. Several of the best explosives, as determined by experiments at the testing station, will be purchased in open market and used in different mines in blasting different types of coal, and the lump and slack coal produced will be carefully screened, weighed, and compared. The classification of these explosives will be made with reference to cost per ton of fuel produced, and various methods of using explosives in mines will be investigated with special reference to increasing safety and efficiency in coal-mining operations.

These explosive investigations will also be conducted with a view to reducing the enormous loss of life in the mines of this country, as compared with the low death rate from mine accidents in those European countries in which testing stations have been maintained for several years. The number of men killed and injured in the coal mines of the United States in 1906, according to Mr. E. W. Parker, chief statistician of the Survey, reached the total of 6,861, the number killed being 2,061 and the number injured 4,800. In 1900 the number killed was 1,493; 1901, 1,594; 1902, 1,825; 1903, 1,794; 1904, 1,959; 1905, 2,097.

The total number of fatal accidents in the coal mines of the United States since 1890 is 22,842, the number practically doubling since 1895.

It has been thought that the very great increase in the production of coal which has taken place in the last decade is responsible for the increase in the number of fatal accidents, but this is not borne out by the figures. In 1895 for every 1,000 men employed in the mines, 2.67 met violent deaths; in 1900, the number killed per 1,000 men employed was 3.24; and in 1906, 3.40 for every 1,000 men.

While the mine death rate in the United States has been increasing at an alarming pace, all European coal-producing countries show a decided decrease, due, it is believed, to the establishment of government testing stations for the study of the use of explosives and other factors relating to safety in mining. Belgium in 1860, before it commenced its experimental work, had a death rate in its coal mines of 3.28 per 1,000 men employed. In 1904, several years after the testing station had been in operation, the rate had been reduced to 1.07 per 1,000 men employed, which is about one-third of the number killed in the mines of the United States to-day.

In the last period of five years the number of men killed for each 1,000 men employed in Great Britain was 1.53; in Germany, 2.49; in the United States, 3.64.

Belgium, which has the lowest rate, maintains the most thoroughly equipped testing station in the world. In all European coal-producing countries the use of excessive charges of explosives is prohibited by law, and definite limits are set as to the amount of any explosives which may be used. The United States has no such precaution.

An analysis of the figures for the United States shows that 50 per cent of all the fatal accidents and 39 per cent of all non-fatal accidents are the result of falls of roof and coal. In the European countries the number of accidents from this cause is much less, which leads to the conclusion that in the United States the very great disturbing and jarring effect which the discharge of large amounts of explosives in a mine exerts is one of the most important factors which bring about the fall of roof and coal. In 1906 gas and dust explosions cost 228 lives in this country; powder, 80; falls of roof and coal, 1,008; and other causes, 732. It is believed that although the actual fall of the rock or coal may not occur at the time of firing the charge, the heavy shots weaken the walls and roof, so that months after, without warning, it falls.

The Experiment Station.—The station which is to be erected in the expectation of reducing the number of mine explosions in this country will consist of an explosives gallery, rescue room, observation house, lamp-testing rooms, and explosives laboratory. The explosives gallery is to be made of boiler plate, and will be in the form of a cylinder, 100 feet long and 6 feet in diameter. A series of safety valves on hinges will be arranged along the top to allow the escape of gas following an explosion. Port holes along the sides, covered with half-inch plate glass, will allow those in the observation house to see whether an explosion has taken place in the gallery during the tests. The cylinder will be filled with natural gas or coal dust and air, and the explosives will be hurled into the gallery by means of a cannon fired by electricity from the observation house, sixty feet away. The cannon will be imbedded in a mass of masonry at one end of the explosives gallery, being backed by a rubber disk on heavy timber which absorbs the recoil. Ten cubic meters of an explosive gas mixture is to be used with each shot, the portion of the gallery next to the cannon forming the explosive chamber by placing a paper diaphragm five meters from one end.

Natural gas is to be used in all the tests because it corresponds most closely to fire damp. It will be purified before using, special care being taken to remove the carbon dioxide, if any is present. The necessary amount of natural gas for each experiment will be measured by a gas meter, and led into the gallery by a two-inch iron pipe for a distance of ten feet along the bottom of the gallery. The pipe is perforated with holes in a manner to insure from the start a more equal distribution of the gas. A fan on the outside of the gallery connected by six-inch iron pipes to the explosive chamber insures the thorough mixing of the gas and air. When the tests are to be made, the fan will be cut out of the circuit by closing the valves situated between the fan and gallery.

The experiments in the gallery will be carried out at a temperature of 25 to 30 deg. Cent., to be regulated by the radiation from steam pipes.

An eight per cent mixture of methane is considered the most dangerous mixture with air. The necessary amount of methane displaces a like amount of air in the explosive chamber, and by experiments and calculation the exact cubic meters of gas to admit in the explosive chamber to produce an eight per cent mixture can be determined.

Before each shot is fired, a sample of the explosive gas mixture is taken from the explosive chamber and tested in the laboratory. It is diluted with a known quantity of air and then ignited. This experiment determines whether the mixture is properly made before the shot is fired.

The cannon in which the explosives are to be fired is made of cast steel with a tool-steel liner. The bore is 46 centimeters in length and its caliber 5.5 centimeters. The axis is at an angle, so that its prolongation intersects the top of the gallery 25 feet from the farther end.

The Testing of Lamps.—The apparatus for testing lamps will consist of a small gallery, through which the natural gas or fire damp will be drawn by an electric fan. Different velocities can be obtained, and the safety lamps can be subjected to an ascending, descending, or horizontal current of an inflammable atmosphere. At the farther end of the gallery the intimate mixture of the air and fire damp is produced by a mixing box, which consists of thirty-six tubes, each of them perforated in the circumference with narrow apertures disposed in spirals. The air passes inside these tubes, and the fire damp penetrates through the 432 small apertures, and the eddies which are produced mix the air and fire damp thoroughly.

Apparatus which is capable of sustaining life will be used, and miners will be instructed to enter a miniature mine which has previously been filled with fire damp, and search as they would for their fellow men. The apparatus consists of canvas jackets equipped with cylinders of compressed oxygen, connected with the operator's mouth by a flexible, rubber-lined metallic tube. The exhalation of the operator is passed through small lumps of potassium hydroxide, the carbon dioxide being absorbed and the remaining products together with more oxygen are again available for the operator.

All explosives, if used in large quantities, will ignite fire damp or coal dust. Tests will be made in the explosives gallery with various explosives, and the maximum quantity of each explosive that can be used safely in mines will be published under the head of "Permissible Explosives." Explosives known as "Safety Powders," in which the temperature at the point of detonation is low and the flame of short duration, will have a higher "limit charge" than the less safe explosives.

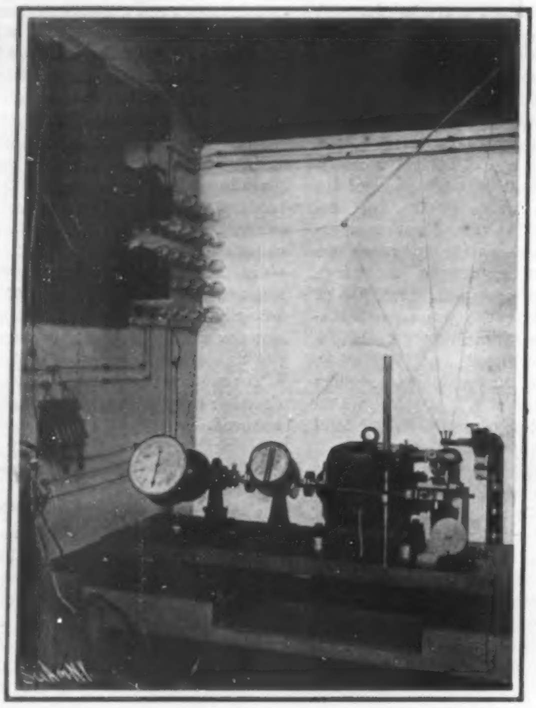
Methods of Testing Explosives.—Tests of explosives will also be made to determine their relative strength, for the efficiency of the explosive must also be considered as well as its safety. No. 1 dynamite, which contains 75 per cent nitro-glycerine and 25 per cent Kieselguhr, is taken as the standard. No two contrivances for measuring the disruptive force produced by explosives produce concordant results. Explosives which detonate at the same rate of velocity permit of

accurate comparison, but when the rate of detonation varies considerably, the comparative results are very misleading.

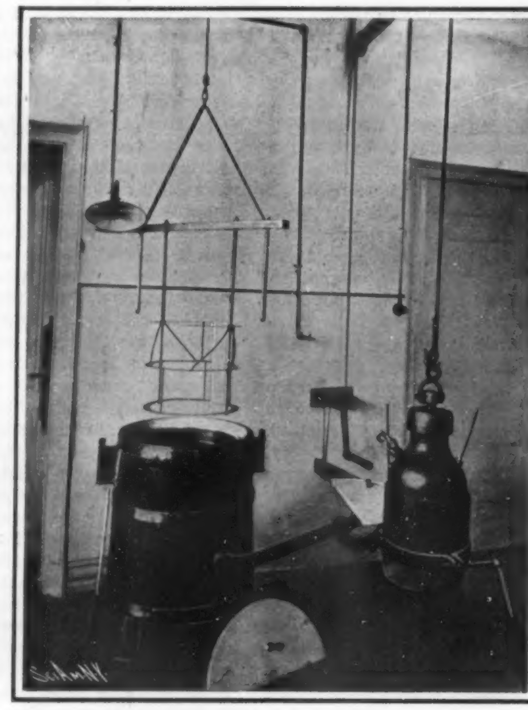
From investigations made by the Technologic Branch of the Survey, the only apparatus which permits of accurate results is Bichel's pressure gage. This apparatus consists of a steel cylinder 31½ inches long and 19¾ inches in diameter. It is strongly made, and the escape of the generated gases produced by the explosion is rendered impossible. The apparatus is constructed to stand the firing of a 3½-ounce charge of high explosives. The pressure exerted in the 15-liter firing chamber is measurable.

The Flame of Explosives.—Experiments conducted at foreign testing stations have proved an incentive to inventors, and a large class of explosives known as safety powders have been produced, and the old powders have been altered and improved upon so that they will conform to the official tests.

The explosive temperature for methane, which is the principal constituent of firedamp, is 658 deg. Cent. or 1,216 deg. Fahr., and is therefore below the detonating point of many ex- (Cont'd on p. 30.)



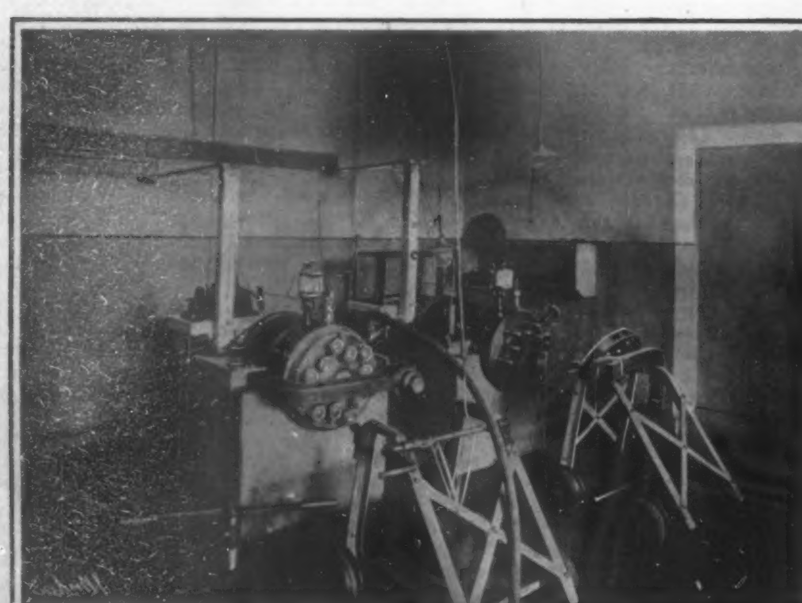
Apparatus for Measuring the Rate of Detonation of Explosives.



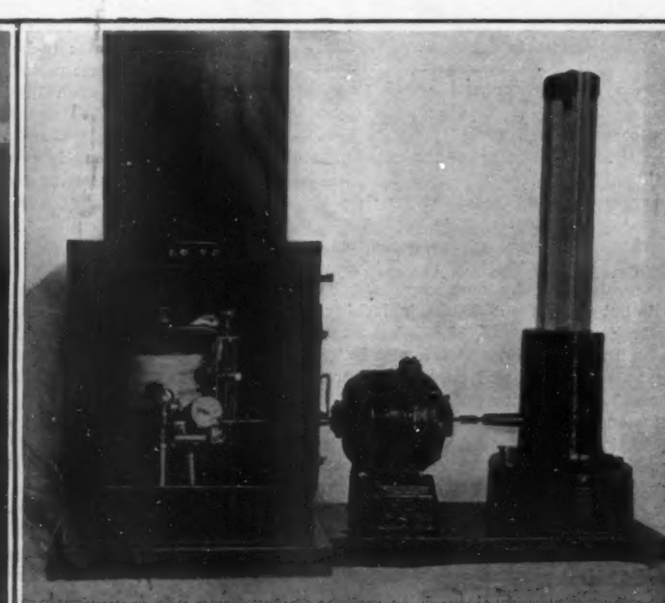
The Calorimeter, Which Measures the Amount of Heat Given Off by the Detonation of Explosives.

Experimental Testing Tube in Belgium.

A Mine Explosion in New South Wales.



Bichel's Pressure Gages, Which Measure the Pressure Exerted by Explosives.



Apparatus for Measuring the Length and Duration of Flame Given Off by Explosives.

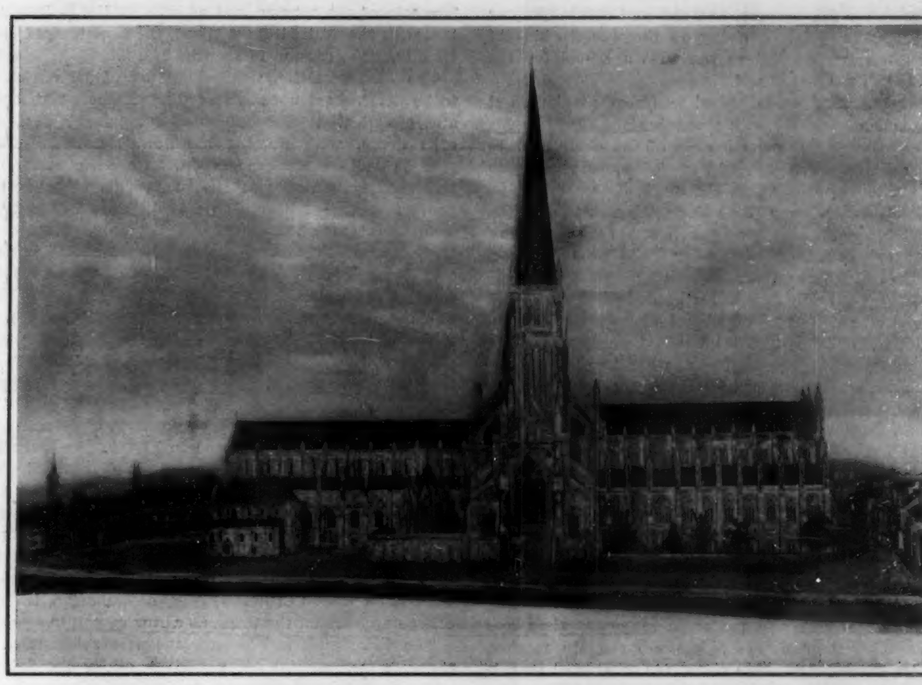
GOVERNMENT TESTS OF MINE EXPLOSIVES.

A COLLECTION OF MODELS OF OLD LONDON.

BY HAROLD J. SHEPSTONE.

What is regarded as the finest collection of models ever made of old London is the series recently completed by Mr. Thorp, a well-known London architect. They represent about four year's patient labor. In all there are seven, made to a scale of eight feet to the inch.

The models depict London as it appeared at the beginning of the seventeenth century, or during the reign of Queen Elizabeth. The one that attracts most attention is undoubtedly that of Old London Bridge. Nearly two years were spent upon it. For centuries London Bridge was the only structure over the tidal Thames, and was regarded with something like awe by those who had occasion to use it as well as by thousands who only heard of it. The bridge superseded the relics of the Roman bridge, which, probably much like other Roman bridges, such as we still see in Germany or Italy, consisted simply of piers of masonry connected by timber beams. The Elizabethan bridge as depicted in Mr. Thorp's model was designed by one Peter, the priest of St. Mary Colechurch, which stood in Cheap or Cheapside. It was begun in 1176, and took thirty years to finish. But Peter did not live to see his great work completed, for he died in 1215, and was buried in the chapel of St. Thomas of Canterbury, sometimes called St. Thomas of London, which stood in the center of the bridge. This chapel formed a kind of keystone or buttress, and was originally a very beautiful building of three stories. At the time of the dissolution in the reign of Henry VIII. it was practically destroyed.



Old St. Paul's, Begun in 1136 and Finished in 1498. The Spire was 520 Feet Tall.

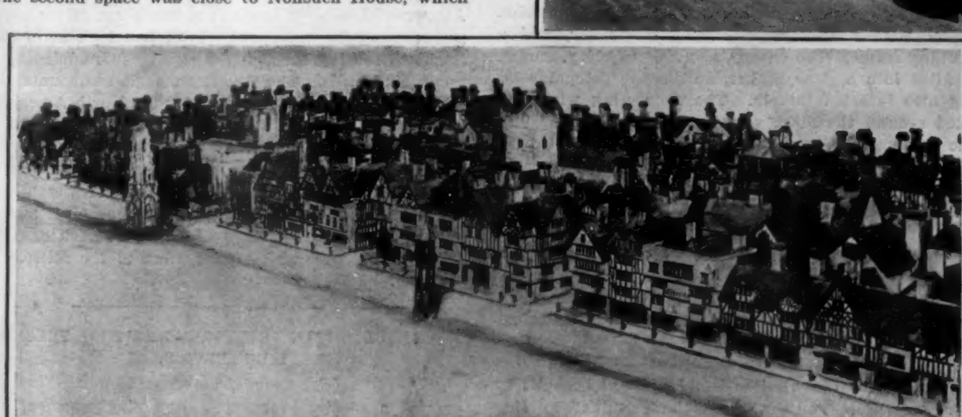
Old London Bridge, Which Stood for More Than Six Centuries. The Bridge was 926 Feet Long and 40 Feet Wide and Was Built on Oak Piles.

On its site, subsequently, another building, the upper part of which was wood, was erected and served as a warehouse. This appears in the model. The tower to be seen at one end of the bridge was part of a system of waterworks, erected in 1582 to supply the city in case of fire. The pumping machinery was designed by a Dutch engineer. Twelve mains led from it to various parts of the city, and the pressure was so small that whenever a fire took place, the eleven mains which were in front of it had to be cut off. The houses on the bridge in the neighborhood of the water tower were burned down in 1633, and it was largely owing to the gap thus caused that the fire of 1666 did not spread across to the buildings on the other side of the river.

As the model shows, there were three open spaces between the houses on the bridge. One, called London Square, was decorated with a statue of St. Thomas. The second space was close to Nonsuch House, which had been made in Holland, brought to England, and put together with wooden pegs, a point of interest to architects of those days. A drawbridge opened below to allow ships to pass up and down the river. The third space, called Traitor's Gate, is very clearly shown in the model, and over the arch the spikes with miniature heads. The bridge itself, it may be worth mentioning, was 40 feet wide and 926 feet long. It was constructed upon oak and elm piles driven into the bed of the river. The piles were covered with thick planks bolted together, on which were built the solid stone piers. These were strengthened by the formation of "stirlings" to protect them against the "scour" of the tide. The bridge stood on eighteen piers, which reduced the waterway to 450 feet at high tide, while at low tide, when the water fell below the stirlings, it was 194 feet less than a quarter of the whole width of the river. In view of this serious obstruction, it is not astonishing that in times of severe frost the river was soon frozen over. That the bridge was well and truly built is shown by the fact that it stood for more than six centuries, and was only destroyed finally after the building of the present London Bridge some 200 feet farther west. The houses, however, had been cleared from the old structure in 1757.

A fine piece of work is the model of old St. Paul's. This church was begun after the first great fire of 1136, but not finally completed until 1498. The spire was considered the handsomest and was the tallest in Europe, rising to a height of 520 feet above the pavement. On the top was a ball supporting a cross and terminating in an eagle. It was destroyed by lightning in 1561. At the west end of the edifice were two massive towers, one of which contained a lock-up for ecclesiastical offenders, and was known as the Lollards' Tower. The Bishops' Palace was on the north side, and behind it was the great church of the Grey Friars, on the site of the choir of which, Christ Church, Newgate, now stands. At first old St. Paul's had no cloister, but in 1332 the garden of the Dean and Chapter

The Outfall of the Fleet, Showing the Edge of the Thames in Elizabeth's Time.



Old Cheapside, London, With the Old Market Provided with Stalls That Could be Removed for Occasional Tournaments.

A COLLECTION OF MODELS OF OLD LONDON.

was taken for the purpose, and the roof of the Chapter House may be detected rising on the western side of the south transept. There was also a school for the choir boys at the east end.

The interior of the cathedral was very spacious, but was much blocked up with monuments. Those to Sir Philip Sydney in the north aisle of the choir near to Sir Francis Walsingham, and one of enormous size to Sir Christopher Hatton, in the south aisle, were there in Shakespeare's time. An older tomb was that of Sir John Beauchamp, popularly believed to be that of Humphrey, Duke of Gloucester, who was however buried at St. Albans. "To dine with Duke Humphrey" meant to wander dinnerless in the cathedral nave. St. Paul's was a cathedral of what is known as "the old foundation." In churches of this type there was a dean assisted by canons, who were responsible for daily services. They were not monks but ordained clergymen, each of them endowed with an estate. Most of these estates were in the neighborhood of London, and the canons, their owners, lived on them as country squires. By degrees they all leased away their prebends, and the modern canons are specially endowed but without estates. The edifice was destroyed in the great fire of 1666, when history records that the lead of its roof and rebuilt spire "ran off like water."

The view of Cheap or Cheapside, that is, the north side of Cheap, shows perhaps more power of realizing an ancient scene from moderate materials than any of the other models. Here we see the old market, with its space for movable stalls, for occasional tournaments, and for the daily and weekly sale of honey for sweetness, of fish for fast days, of wine, of bread, of fruit, of poultry, as well as the more permanent purposes of the mercers, the hosiers, the cordwainers, the furriers, and all the other merchandise of a great city. We can understand when we see the space between the Cross and the Conduit that in the days of Edward I all the "selds," or booths, were cleared out of Cheap for the homecoming of the King and Queen from the Holy Land, and in the days of Edward III, when the young king held a tournament in honor of his young queen. The lists were set up between the Cross and Conduit, near Bow Church, where we may suppose the space was widest. A scaffold fell. The mayor would have prosecuted the carpenters, but the queen saved them from punishment, and we read, "purchased great love of the people."

"The Outfall of the Fleet" is the title of a long and interesting model which shows the edge of the Thames in Elizabeth's time from Bridewell to Banyard Castle. A great point of interest in this model is that it marks the old houses of Blackfriars, which, on account of sanctuary, were the site of the theater, whose place is still marked by Playhouse Yard in the Times office. We know that Shakespeare had some estate here in Blackfriars, and a deed relating to it is in the library of the London Guildhall.

GOVERNMENT TESTS OF MINE EXPLOSIVES.

(*Concluded from page 28.*)

plosives. The characteristic of the safety powders is the production of a small flame, and of short duration, so that the products of combustion after the explosion in the drill hole are cooled down before reaching the surface. The heat being partially absorbed by the surrounding walls, and the flame being small and of short duration, reduces the chance of a gas or dust explosion to a minimum. An explosive in which the rate of detonation is too rapid may blow out the coal too quickly, and project its flame immediately into the inflammable gas mixture. Gelatine dynamite and other high-grade dynamites may be classed in this list. On the other hand, black blasting powder, while it does not detonate in practice and perform its work quickly, causes explosions on account of the large flame and its duration which brings it in contact with the inflammable gas mixture.

Early attempts to reduce the length of flame by surrounding the explosive with material containing water were unsuccessful. The incorporation in the explosive of chemicals containing hydration water, as the class containing less than 30 per cent of nitro-glycerine, have proven quite successful, as have the nitrate of ammonium class in less degree.

The use of dynamite and black blasting powder in foreign coal mines which are known to generate gas or are troubled with coal dust has been prohibited, and they have almost universally been replaced by the so-called safety powders.

The apparatus used at the German station to determine the length of flame consists of a steel cannon, which is loaded with the explosive to be tested and fired. The flame is photographed at night upon a rotary drum. The entire photographic instrument consists of a wooden box provided with a quartz camera lens for focusing the ultra-violet rays. Inside the camera a rotary drum covered with sensitized film is fixed between two pointed screws in a guide bracket. The drum is motor driven, and the number of revolutions recorded on a vibration tachometer. A cartridge of the explosive to be tested is inserted in the borehole of the cannon, and as soon as the tachometer indicates the desired drum speed, the shot is fired electrically. The cannon is seen in Fig. 2.

The Rate of Detonation.—The rate of detonation is to be determined upon a recording device which operates electrically. The apparatus comprises a soot-covered drum, with pointed platinum terminals, tooth gear and measuring adjustment, an electric motor, vibration tachometer, and sparking coils. The rotary drum is made of bronze, the lower edge being fitted with teeth, of which there are the same number as there are millimeters to the circumference, about 500. The drum is operated by the motor, and its peripheral rotation speed and the device for reading it are so that the distance between two points of the drum may be measured with 100th part of a millimeter. An iron pipe is filled with the cartridges to be exploded. This pipe is 30 millimeters inner diameter, and the density of the charges plays a very important part in regard to correctness of results. The apparatus for determining the rate of detonation is seen in Fig. 3. In operating the recorder, the electrical current is shunted through resistances and connected in parallel with primary and secondary coils in such manner that when these circuits are broken by the explosion, a succession of corresponding sparks is emitted by induction from the terminals of the secondary connections, thereby marking the blackened drum. Owing to oscillation, the discharge appears on the drum as a row of points.

The Calorimeter.—This apparatus is constructed to measure the amount of heat given off by the detonation of explosive charges of up to 100 grammes. From the calorimetric results obtained, the maximum temperature of explosion is calculated according to Berthelot's well-known formulas. This apparatus consists of a calorimetric bomb, an inner receiver or immersion vessel with a tub, registering thermometer, and a hooking frame. The charge, about 60 to 100 grammes, is filled into a glass beaker, an electric detonator being also inserted therein. The connecting wires are fixed around the glass vessel, which is suspended in the bomb cavity, and then severally connected to the pin in the stopper and the projecting valve nozzle. After charging and closing the bomb, the air is exhausted and the valve shut. The sheet nickel receiver rests in its tub on a triangular wood block. Inside the receiver a shallow tripod ring is placed, and on to this the bomb in its hooking frame is lowered. The receiver must contain sufficient water to cover the whole of the bomb up to the screw in the lid. The calorimeter is seen in Fig. 4.

THE SCIENTIFIC AMERICAN TROPHY.

A tower for the wireless telephone will be built by Dr. Lee DeForest on the roof of the Terminal Building at Park Avenue and 41st Street. The steel structure will rise 85 feet above the top of the Terminal Building, with poles extending above the tower itself for an additional 40 feet; the tips of the poles will thus be 300 feet above the pavement.

THE FIRST TRIAL FLIGHT OF AN AEROPLANE FOR THE SCIENTIFIC AMERICAN TROPHY.

Over a year ago the proprietors of the Scientific American presented to the Aero Club of America for annual competition the handsome silver Trophy shown in the accompanying illustration. The deed of gift provided that this trophy should be competed for annually by heavier-than-air flying machines only, and that the conditions to be fulfilled in competing for it should be changed from time to time so that they would always be a little more difficult than that which had actually been done. In this way it was hoped that not only aeroplanes, but that all types of flying machines (such as helicopters, or lifting-propeller apparatus, and ornithopters, or flapping-wing flyers) would receive encouragement and be rapidly developed.

The date set for the first contest for the Scientific American Trophy was September 14, 1907, and the place the Jamestown Exposition. A flight of a kilometer (3,280 feet) in a straight line was required, as this was thought to be sufficiently easy for any new aeroplane to accomplish. As no machines were ready at that time, there was no contest for the year 1907, and up to a short time ago no machine had been brought forward in America capable of making a straight-line flight of this length, with the exception of the Wright brothers' aeroplane.

Of all the efforts being put into the development of flying machines in America, none has been more systematic and thorough than that of the members of Dr. Alexander Graham Bell's Aerial Experiment Association. This association was formed last summer for the purpose of assisting Dr. Bell to develop his tetrahedral-cell aeroplane. In the last six months the members have experimented with no less than three separate aeroplanes—the "Red Wing," the "White Wing," and the "June Bug." The first of these was fitted with runners, and it rose successfully from the frozen surface of Lake Keuka on March 12 and made a short flight of 318 feet and 11 inches. This was the first aeroplane that has ever been tested in this way. The farthest distance flown by the "White Wing," which was mounted on wheels so as to run along the ground and rise in the air, was 1,017 feet. The "June Bug," which was only recently completed, has made a number of flights, the longest of which was 3,420 feet, or 140 feet more than a kilometer. As soon as it had succeeded in covering this distance, the association requested the Aero Club to give their machine a first official trial for the Scientific American Trophy. Arrangements were made for this trial to be held at Hammondsport, N. Y., on July 4. We expect to describe this test in our next issue.

The holding of the trial on Independence Day was a particularly fitting date for an American machine to fly for a trophy offered by the oldest American mechanical journal for encouraging the development of the new science of aviation—a science which originated in this country as far as the application of mechanics to flight is concerned, and the leading exponents of which in the world to-day are American citizens—the Wright brothers. Although great strides have been made in France during the past year in the development of aeroplane flying machines, the success of the Aerial Experiment Association's latest aeroplane augurs well for an even more rapid development of such machines in this country from now on. As soon as a general interest is aroused by public demonstrations, encouragement will be offered to the inventors of our country to redouble their efforts to develop a successful and commercial flying machine.

As a result of a preliminary correspondence with several leading aviators, we feel certain that within two or three months we shall be able to announce a contest for the trophy in which those most skilled in the new science, both here and abroad, shall meet and demonstrate who has the better machine.

As can be seen from the illustration, the Scientific American Trophy consists of a handsome silver globe representing the firmament. Prof. Langley's aeroplane is shown soaring through the clouds, surrounded by a number of birds. The American eagle surmounts the globe and on the reverse side of it the North American continent is shown. The globe is mounted upon a handsome pedestal, on the base of which are horses whose riders bear aloft palm branches and wreaths of victory. The trophy is a masterpiece of the silversmith's art. It stands 32 inches high over all and is valued at $2,500, but the real value is much greater, for it will prove a strong stimulus to the science of aviation.

SUCCESSFUL TEST OF NEW YORK'S NEW HIGH-PRESSURE FIRE SERVICE.

(*Concluded from page 24.*)

pumps are direct-connected and the former are rated at 800 horse-power each and are constant-speed induction motors using three-phase alternating current of 25 cycles at a pressure of 6,300 to 6,600 volts, and like the pumps were built by the Allis-Chalmers Company. Centrifugal pumps were

selected on account of their simplicity of action, the small amount of space required for each unit, and for their efficiency, especially when operated by electricity. They are of the horizontal multi-stage centrifugal type, each pump having six stages and being able to deliver 3,000 gallons of water per minute against a discharge pressure of 300 pounds per square inch and a suction lift not exceeding 20 feet. The pressure supplied by these pumps can be varied between 100 and 300 pounds by means of a special regulating valve which automatically will hold the pressure at any desired point.

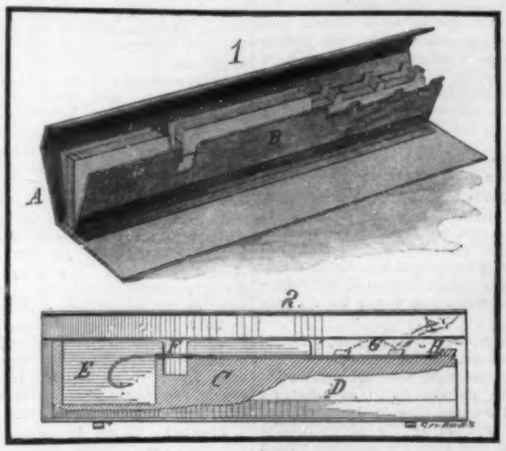
The pressure regulation in a high-pressure system is a matter of considerable importance, as it must be varied at the direction of the chief in charge of the fire, who is in direct telephone communication with the engineer at the switchboard. The use of electricity makes the control of the pumping machinery a most simple matter, as a single operator at the switchboard not only can start and stop the pumps at once, but he can regulate the electrically controlled gate valves of the water mains.

After preliminary tests had been made of the machinery in the station and of the mains and hydrants in the streets, an initial test by the fire department was held on June 28, special detachments from various fire companies with new and extra strong hose and various types of nozzle holders being told off for the work. Eight hydrants were employed, and through these was driven the water delivered from three pumps at the Oliver Street station and three pumps at the Gansevoort Street station, the full pressure of 300 pounds at the pumps being maintained at both stations. The hydrants were selected and the hose was laid so as to concentrate the discharge of water at West and Twelfth Streets. The number of streams made available was far greater than would be required for any single fire, and it was demonstrated that the pressure on the mains at a distant point such as at Gansevoort Street, when only the Oliver Street station was in operation, suffered no material loss. The hose used was 3 inches in diameter and the nozzles were 2 inches and 1½ inches, respectively, in two series of tests. From five hydrants fifteen lines of hose, each of 250 feet length, were laid, and from each of three additional hydrants three lines of hose each 600 feet long, were taken, so that there were available twenty-four streams with a capacity of over 18,000 gallons per minute and a nozzle pressure of from 60 to 70 pounds with a 2-inch nozzle. In the second test 1½-inch nozzles were used for some of the lines, while others were "siamesed," or two lines united by a coupling to form a single line, and on these 2-inch nozzles were used and connection was made to the vertical pipe of a water tower and also to its turret nozzle. The water tower being designed for much lower pressures was barely able to withstand the test, but its streams were borne with great force. With a smaller number of streams, but still throwing over 18,000 gallons of water, greater nozzle pressures were available and these reached 175 pounds, showing that the greatest loss of pressure was experienced between the hydrant and the nozzle, amounting in some cases to over 100 pounds on the longer lines of hose. The streams were thrown to the top of a twelve-story building, and were carried several blocks in a horizontal direction. Perhaps the greatest interest from the fireman's standpoint attached to the nozzle holders, as here at present is the crucial point of the system. The high pressures naturally cannot be handled by one or two men at the nozzle unassisted, and as a result some mechanical device is necessary. There were employed spider-legged nozzle holders which seemed to answer, and also a device containing a prong which was driven into the pavement with a sledge hammer and supported in a framework the hose and nozzle. Battery wagons with proper valves and turrets have been suggested, and other devices, including reducing valves to apply at the hydrant, the last being desirable on account of the different pressures which it might be necessary to use on different lines at the same fire, as where a fireman is required to carry a hose into a building and use it at close range.

In each station will be maintained two shifts of employees, including one engineman, one switchboard operator, one oiler and two laborers. All of the electricity is carefully metered and recorded, and account is kept as well of the consumption of water by Venturi meters. The adoption of the high-pressure system means the elimination of the fire engine with its expense for fuel, horses, and care, as new and larger hose wagons will carry the crew of fighting firemen, together with all the auxiliary apparatus needed. It is intended that the New York high-pressure system shall be used on all first-alarm fires, and eventually all of the engine companies in the protected district will be transformed into hose companies, supplied with hose wagons containing extra strong hose. The companies responding to first or second alarms outside the district, however, will retain their engines, but it is probable that the high-pressure mains will be extended to other portions of the city.

BOOK FOR FISH HOOKS.

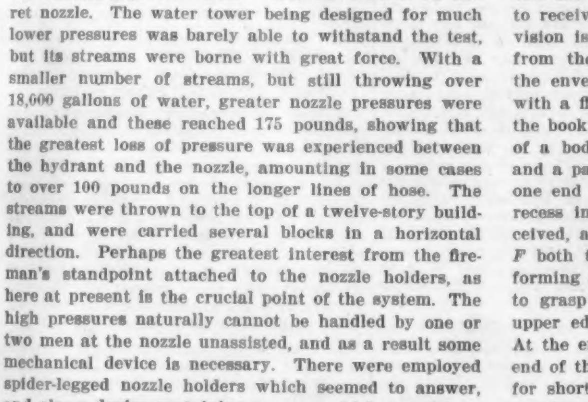
The book illustrated in the accompanying engraving is particularly adapted to carry snell fish hooks in such manner that they can be placed in the pocket without danger of accidental engagement with the clothing or other objects. The hooks are also carried in such a manner that the snells are stretched to prevent them from snarling or receiving other injury. The book is provided with a suitable covering envelope, and has a number of leaves, each of which is formed to receive snell hooks of different sizes. Special provision is made to facilitate the removal of the hooks from the book whenever desired. In the engraving the envelope cover is indicated at *A*. It is provided with a flap, which will close over the opposite side of the book and cover the leaves *B*. Each leaf is formed of a body *C* of pasteboard, wood, or other material, and a pair of side pieces *D*, of celluloid or paper. At one end the body of the leaf is cut away, forming a recess in which the hook proper is adapted to be received, as indicated in the sectional view, Fig. 2. At *F* both the body *C* and side pieces *D* are cut away, forming a notch in which the fingers may be inserted to grasp the hook. The snell is stretched along the upper edge of the body *C* between the side pieces *D*. At the end of the leaf is a tongue *H*, over which the end of the snell is caught. In order to adapt the leaf for shorter snells, tongues *G* are formed on the side members *D*, over which the end of the snell may be secured. The book is held in closed position by means of a pair of rubber bands. The inventor of this hook book is Mr. Pierre V. Ericson, Cherokee Avenue, Hollis, N. Y.



BOOK FOR FISH HOOKS.

ATTACHMENT FOR PRINTING STAMPS.

In order to prevent check raising or fraudulently increasing the amount of a bank check, it is customary to stamp a limiting value on the face of the check, such as "Not over three thousand dollars," or whatever the amount may be. Special stamping machines have been invented for this purpose, and they are almost universally used, not only for checks, but for any papers or instruments that need similarly to be protected. We are informed that there are over forty thousand stamping machines of one type alone now in use. In checks and papers of different size and shape, it often is a matter of difficulty to stamp the protecting clause neatly and at the desired point of application. With a view to overcoming this difficulty, the attachment illustrated in the accompanying engraving has recently been invented. The attachment is particularly adapted for the type of stamp here shown, comprising a base and, mounted thereon, a rotatable barrel in which the printing type and other mechanism are carried. At one end of the barrel is a head, by which the stamp can be adjusted for different amounts in the limiting clause. The check is inserted in the slot at the base of the barrel, and the stamping is done by operating the handle above the barrel. The attachment consists of a sheet-metal shelf *A* which is secured to the machine below the slot just referred to. Mounted in brackets *B*, on the under side (Fig. 2) of the shelf, is a U-shaped rod *C*. One end of the rod, which is bent upward and projects through an opening *D* in the shelf, serves as a stop to limit the insertion of the check in the slot. Extending over the check, above the slot, is a plate *F*, whose forward edge is on a line with the printed clause formed by the stamp. On the opposite side of the barrel is a plate *G*, with two tongues projecting respectively through a pair of openings *H* in the shelf. One of the tongues is rigidly secured to the adjacent end of the U-shaped rod *C*. The plate has a stop *J* alined with the stop *E* on the opposite side of the barrel. The stops may be adjusted to any desired position by moving the plate *G*, and a thumb nut *K* may be jammed against the shelf to lock the plate at the desired adjustment. One of the openings in the shelf is enlarged, as shown at *L*, to permit the operator to view an adjusting screw of the stamp located below the shelf. The inventor of this attachment for printing stamps is Mr. Myron E. Crowley, of Sharpsville, Pa.

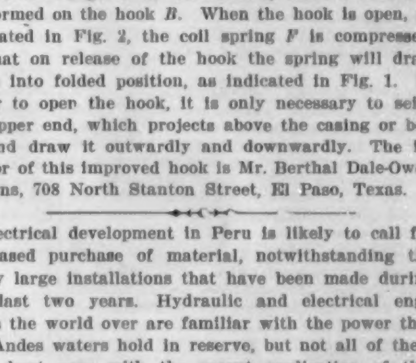


ATTACHMENT FOR PRINTING STAMPS.

HOOK FOR GARMENTS.

Pictured in the accompanying engraving is a clothes hook of the folding type, which is particularly adapted for use in theaters to be attached to the backs of chairs. The advantage of this hook is that it does not project beyond the support to which it is attached. The hook, when not in use, will automatically and noiselessly move into folded position. In Fig. 2 of the illustration, a section is shown of the hook, which readily reveals the construction. It comprises a body or box *A*, which is secured to the back of the chair or other support. The face of the body *A* is slotted, and mounted in the lower end of the slot is the hook *B*. The latter when in folded position is adapted to engage a buffer *C*, which may be of leather, rubber, or any material that will deaden the sound of the hook when snapping into folded position. Projecting through the upper wall of the box *A* is a screw *D*, which passes through a U-shaped hanger *E*. On the screw is a nut fitted between the side walls of the hanger *E*, in such manner that it cannot revolve. Between the nut and the upper end of the hanger, is a coil spring *F*. The tension of this spring may be regulated by turning the screw *D* in the nut. The lower end of the hanger *E* is connected by links *G* to a web *H*, formed on the hook *B*. When the hook is open, as indicated in Fig. 2, the coil spring *F* is compressed, so that on release of the hook the spring will draw it up into folded position, as indicated in Fig. 1. In order to open the hook, it is only necessary to seize its upper end, which projects above the casing or box *A*, and draw it outwardly and downwardly. The inventor of this improved hook is Mr. Berthal Dale-Owen Havens, 708 North Stanton Street, El Paso, Texas.

Electrical development in Peru is likely to call for increased purchase of material, notwithstanding the fairly large installations that have been made during the last two years. Hydraulic and electrical engineers the world over are familiar with the power that the Andes waters hold in reserve, but not all of them have kept pace with the recent application of this power and with the prospects for its further utilization. Some of the larger projects will have to wait a further period of industrial growth before they can become commercially feasible.



HOOK FOR GARMENTS.

RECENTLY PATENTED INVENTIONS.

Electrical Devices.

SYSTEM OF ELECTRIC TRACTION.—S. H. HOOPES, JR., West Chester, Pa. One of the objects in this invention is to provide a system of electric traction for railroads, tramways, and the like, comprising a series of independent sections constituting an electric circuit, and means for conducting the current from the circuit at the sections, successively to a car, in such a manner that the car is in electrical connection with at least one section all the time.

Of Interest to Farmers.

STALK-PULLER, SEEDER, AND PULVERIZER.—R. J. BOGUE, Paris, Texas. This invention relates to certain improvements in agricultural implements, and more particularly to an implement designed for pulling corn stalks, cotton stalks, or the like, for pulverizing the ground, and for seeding and planting. Mr. Bogue has invented another stalk puller, seeder, and pulverizer which relates more particularly to a hollow drum adapted for use in the pulling of corn stalks, cotton stalks, or the like, and for seeding and planting. The drum is adapted for use with various types of machines, but preferably in connection with the machine illustrated and claimed in his previous application, from which this application has been divided.

Of General Interest.

PROCESS OF SMELTING ORES.—F. L. MCGAHAN, St. Louis, Mo. The improvement has reference to smelting of ores, and more particularly to a process by which certain unconsumed gases and products of combustion from the smelting furnace are not discharged into the admixture in the usual manner, but after being suitably treated are returned to the furnace.

ENVELOP.—W. MACDONALD, Verna, Saskatchewan, Canada. In the present patent the object in view of the inventor is the production of a simple and cheap envelop of the safety type, whose flaps may be securely locked together mechanically and with or without the aid of mucilage.

Hardware.

WRENCH.—B. W. HOPS and S. F. STAMBAUGH, Shelby, Ohio. In this wrench the side plates and the sliding plates carry their respective jaw blocks and are flanged to slide one upon the other in the operation. This flanging of the side and sliding plates also gives such parts rigidity in a lateral direction and aids in securing the desired strength without unnecessarily increasing the weight of the wrench.

CARPET-STRETCHER.—T. WALKER, Pleasant Hill, Ore. A single member is provided serving the double purpose of a hinge and a slide, so as to permit of a sliding movement of the sections to vary the length of the handle as desired, and also to permit of a bending or straightening movement, to bring the sections into approximately parallel positions in the stretching and to hold them against return movement while the carpet is being secured in place.

LAWN-MOWER SHARPENER. — J. F. HOCKER and B. M. SMITH, Monroe, Ind. The invention refers to improvements in sharpeners for the knives of mowers using a rotary reel or blade carrier, the object being to provide a device which shall be easily and quickly attached to an ordinary lawn mower, and one which may readily be adjusted to varying conditions of structure.

DOOR OR WINDOW SECURER.—A. W. PETERSON, Ironwood, Mich. The objects of this new type of thumb-screw are to reinforce the action of the screw by a shoulder set obliquely to the axis of the screw; to make it convenient to remove or insert the object to be fastened without removing the screw; and to provide a fastener that may be conveniently operated without the use of a screwdriver or any other tool.

WRENCH.—D. F. GEIGER and J. J. GEIGER, Barlow, N. D. The invention relates to wrenches having revoluble sockets for engagement with nuts or other articles located in places hard to reach by an ordinary wrench. The object is to provide a wrench easily manipulated, and arranged to permit of conveniently engaging and forcibly turning the nut or other article in either direction.

Heating and Lighting.

ACETYLENE-GAS GENERATOR. — O. H. HASNEDER, Seaford, N. Y. The generator is practically automatic in its action, and an improvement upon the one for which Letters Patent were formerly granted to Mr. Hasneder, to the extent that the entire machine is simplified in construction, and wherein the feed is rendered accurate, positive, and sure, and wherein also the feed is of such detail construction and its operation is such that sticks and other foreign matter are prevented from passing into the generator with the charge of carbon.

Household Utilities.

HOUSE-TANK CLEANER.—J. O'CONNOR, New York, N. Y. In this patent the invention has reference to tank cleaners, the more particular object being to produce a portable device which may, at a comparatively small expense, be readily attached to tanks already in existence, and which provides a simple and efficient construction for accomplishing the work.

CURTAIN-FIXTURE.—J. KRODER, New York, N. Y. The object here is to provide a curtain fixture, formed of a split tube reinforced at each end of a rod in such a manner as to render the fixture comparatively light but exceedingly strong and convenient, for removable engagement with a socket or other support attached to the door, window, wall, or the like.

Machines and Mechanical Devices.

MACHINE FOR MAKING PAPER CUPS.—C. TIETZMANN, New York, N. Y. The machine is capable of being operated by power, and is so constructed that it will cut, corrugate, and shape the cups from sheets of paper automatically fed from a roll and will further form the required flange at the edge of the cup giving the flange in one operation the first fold and in the next operation the final fold, and in the final operation to clench or flatten the completed flange and discharge the cup from the machine.

STONE-GATHERING MACHINE. — E. B. LAMME and E. KETTERER, Bozeman, Mont. The object of the invention is to improve the form of vehicle body and the receiver to which gathered material is delivered; to improve the picking and elevating means with their controlling appurtenances, with a view to so arrange and support these parts relatively to the vehicle body and wheels as to afford maximum strength and resistance to the strains incident to the operation, while providing a simple and practical construction effective and expeditious in picking up and delivering the material.

Prime Movers and Their Accessories.

CURRENT WATER-MOTOR.—R. E. COON, Portland, Ore. In this case the object is to provide a motor of high power and of cheap installation which shall be specially adapted for use in running streams for pumping water for irrigating and mining purposes, but which is applicable for furnishing power for all purposes.

IGNITER. — W. L. WATRYNEN, Dolph, S. D. The invention pertains to certain improvements in igniters for internal combustion engines, and the purpose is to so construct the igniter that its operation is dependent not only upon the position of the piston within the cylinder, but also upon the pressure within the cylinder.

Railways and Their Accessories.

MEANS FOR CONTROLLING PNEUMATIC SIGNAL-PIPES ON RAILROAD-TRAINS.—W. S. DE CAMP, Chillicothe, Ohio. This improvement consists in providing a signal pipe continuously open from end to end and uninterrupted between cars by any stop cocks or other closures and interposing between the reducing valve for the main reservoir and the signal valve of the engineer's whistle a threeway cock by means of which the continuity of the air from the main reservoir to the signal pipe may be maintained, or the air cut off from the signal pipe at the will of the engineer.

PNEUMATIC ADJUSTER FOR ANGLE-COCKS ON TRAIN-PIPES.—W. S. DE CAMP, Chillicothe, Ohio. This invention consists of the novel construction and arrangement of parts whereby the engineer through the signal pipe has perfect control over the opening of the angle-cocks without interfering with the independent manual closing of any angle-cock by a brakeman in separating the train.

Pertaining to Recreation.

SINGLE-TRIGGER ATTACHMENT FOR DOUBLE-BARRELED GUNS.—A. D. BLANCHARD, El Reno, Okla. The entire firing attachment of the gun consists of the two hammers, two sears, and a single trip device, so that there is a minimum number of parts and no liability of the same being deranged or becoming inoperative. A safety stop or lock is employed which engages the forked upper end of the trip and prevents its lateral oscillation, so that neither barrel can be fired until the stop is withdrawn.

GAME APPARATUS.—H. J. FINLAY, New York, N. Y. The intention in this improvement is to provide a game apparatus, more especially designed for playing "stock exchange," and arranged to afford amusement to the players and onlookers, and to require considerable skill on the part of the players to successfully play the game.

Pertaining to Vehicles.

SHOCK-ABSORBER.—F. DOROST, Paterson, N. J. The device is so constructed that it may be attached to any vehicle irrespective of the distance between the points of attachment, without interfering with the predetermined relationship of the resistance members. Improvements are provided in the means for resisting the free movement of the members and varying the resistance in accordance with the extent of the movement of the members in respect to each other.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Notes and Queries.

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(10815) T. E. C. says: A recent magazine article was devoted to an account of "The Arcturian Theory." In it the author claims that both the earth and sun, together with attendant planets, are controlled by the star Arcturus; that they make the circuit around Arcturus once in every 104,000 years; that we have what is called the "Arcturian seasons," spring, summer, autumn, and winter; that we are now entering upon the "spring" season, which will last 26,000 years. Has this subject ever been handled in the SCIENTIFIC AMERICAN or SUPPLEMENT, and where can I get books for further information? A. We do not know where you can obtain books upon the control of Arcturus over the sun. It may be marked "Interesting, if true," and allowed to pass. Astronomers are agreed that the sun is moving nearly in the direction of the bright star Vega, now in the evening sky of the northern hemisphere, with a velocity of about 12 miles a second. That is all the knowledge had upon that subject. It is a narrow foundation for a magazine story, but stories have been built on slenderer, and probably will still be so built. It is beyond the scope of a scientific journal to handle such a subject. A recent book, Hale's "Stellar Evolution," price $4, is more likely to be reliable reading. We can supply you with the book and shall be glad to receive your order for a copy.

(10816) W. T. B. says: Referring to query by H. A., 10774, May 23, in your reply to the stale and silly question, "Will a cask of water weigh more with a fish in it than without a fish in it?" you make the astonishing assertion: "The whole depends upon whether the fish is alive." What do you mean? Is it your meaning that a live fish in water has no weight? It seems to me that any person with ordinary common sense knows that if a fish weighing 15 pounds dead or alive is put in a cask of water weighing 50 pounds, the weight of the cask of water and the fish will be 65 pounds. If not, why not? A. Referring to our reply to query 10774, May 23, 1908, we would remark that you appear never to have seen a live fish contract itself by compressing its air bladder till it sank to and rested upon the bottom of a tank. A part of the weight of the fish was borne by the bottom of the tank, and all was not borne by the water. A dead fish also may sink to the bottom and rest upon the bottom. In both these cases the weight of water displaced will not equal the weight of the fish, but will be less than the weight of the fish. A dead fish, however, soon floats by reason of gases generated in it by decomposition. It then displaces its weight of water.

(10817) A. B. says: Kindly let us know the correct way to spell benzine. Either benzine or benzene. A. Benzine is the liquid which comes off between 120 deg. and 150 deg. C. in the distillation of petroleum. It follows naphtha, which comes off between 80 deg. and 120 deg. C. It is often called naphtha, and sold as such. It is followed by kerosene, which comes off between 150 deg. and 300 deg. C. Benzene is a hydrocarbon, produced in the distillation of coal. It is also present in coal tar. It is one of the most important of the coal-tar products, as from it many dyes and valuable chemicals are manufactured. You should spell the one you wish to use. They are not alike, and cannot be confused with each other.

(10818) B. B. asks: Will you kindly give some information concerning the following? Very often, as a means of amusement, one person will lie on the floor, a table, or some chairs, while others, perhaps two or three on each side, will place their fore-fingers under the first, and when all have inhaled a deep breath will easily lift the subject to any height they can reach. I have been told this by many, and all claim that the effort required to lift the subject when all have inhaled a deep breath is very much less than when this is not done. In fact, it is said that the weight cannot be lifted at all by means of the fingers, as described, unless all freely inhale. Can you give any light regarding the matter? A. We have given our explanation of the feat of lifting a person by four or six others, who place their fingers only beneath this person while he is lying rigid upon the floor, and lift at a signal after drawing in a long breath. If this person weighs 150 pounds, one-quarter of his weight is 37½ pounds. There are few people who cannot lift that weight with perfect ease with the first finger. We have lifted 150 pounds with a little finger when young. We see nothing in the feat excepting that the drawing in of the breath diverts the attention from the act of lifting. It is very certain that a spring balance inserted would show what weight each person actually lifts, and we have no doubt that the sum of weights lifted would equal the weight of the person. Be assured there is no magic in the thing.

NEW BOOKS, ETC.

THE ARCHITECT'S AND BUILDER'S POCKET BOOK. **A Handbook for Architects, Structural Engineers, Builders, and Draughtsmen. By Frank E. Kidder, C.E., Ph.D., Author of "Building Construction and Superintendence." 15th Edition, revised. New York: J. Wiley & Sons. London: Chapman & Hall, Ltd., 1908. 12mo.; leather; 1,000 illustrations; 1661 pages. Price, $5.**

It is unlikely that any dissent will be expressed with the manner in which the Kidder Pocket-Book enterprise has been carried through its fifteenth edition. The present volume is a complete contribution to architects' and builders' needs, and due in great measure to changes which include the important production of an entirely new chapter on Reinforced Concrete, the work of Mr. Rudolph P. Miller, chief engineer of the Department of Buildings, New York city; the same authority also in a revised chapter on Fire-Proofing; and Prof. Alvah H. Sabin's work in bringing the section on Paints and Varnishes thoroughly up-to-date. There is a vast amount of material presented that is of use to many professions and industries outside of those named in the title page, and the accuracy of the tables, weights and measures, formulas, etc., is an advantage to all who have no time to work out problems. The glossary, the legal definitions of architectural terms, and the index, are salient features of this most useful handbook.

GENERAL PHYSICS. **An Elementary Text-Book for Colleges. By Henry Crew, Ph.D., Fayerweather Professor of Physics in Northwestern University. New York: The Macmillan Company, 1908. 8vo.; cloth; 522 pages. Illustrated. Price, $2.75 net.**

The text is intended to be adapted to the needs of colleges. A close look into the scope of this work will inspire the belief that it is to have a wide range of acceptance for its method in presenting a vast amount of fact which will be to any reader a consistent guide for straight and accurate thinking. In the introduction the position of Physics is located among the different sciences, and its elementary exposition is dealt with in chapters on kinematics, simple harmonic motion, general properties and special properties of matter, waves, sound, theory of heat, magnetism, electrostatics, electric currents, light, and optical instruments.

THE THEORY OF OPTICAL INSTRUMENTS. **By E. T. Whittaker. New York: G. P. Putnam's Sons. 12mo.; paper bound, 72 pages. Price, 75 cents.**

Students of astronomy, photography, and spectroscopy have frequently expressed a desire for a simple, theoretical account of those defects of performance of optical instruments to which the names coma, curvature of field, astigmatism, distortion of secondary spectrum, want of resolving power, etc., are given. The need is met to a great extent by this little work, in which the reader is led directly from the first elements of optics to those parts of the subject which are of greatest importance to workers with optical instruments. A short account of the principal instruments is added.

THE PREFERABLE CLIMATE FOR CONSUMPTIVES. **By Charles Denison, A.M., M.D. Denver, Col.: Charles Denison, M.D. Quarto; paper cover.**

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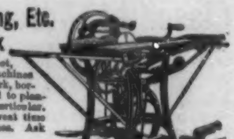
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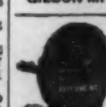
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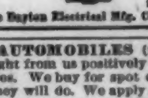
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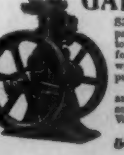
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FOR SALE.—Patent No. 888,568. An improved aeroplane. A pioneer. Obtains a vertical up-pressure by utilizing the partial vacuum which exists in front of every revolving propeller and so uses part of motor energy lost in every other form of aeroplane. Enormous uplifting power. Solves the problem of heavier-than-air flight. European rights for sale. See SCIENTIFIC AMERICAN, June 20, 1908. For particulars address W. P., Box 614, Seattle, Washington.

Inquiry No. 8611.—Wanted to buy springs for light power purposes.

FOR SALE: Melon Carrier, Patent No. 882722, date March 24, 1908. Send for Descriptive Circular to W. A. Stark, Webster Flats, Tacoma, Wash.

Inquiry No. 8620.—Wanted to buy aluminium cans.

FOR SALE OR ROYALTY.—Automatic and Lever Numbering Machine combined. Prints odd or even, consecutive, and repeats any No. 2, 3, 4, 5, etc., up to 14 times. Also repeating attachment. Send for circular. Box 265, Chicago, Ill.

Inquiry No. 8623.—Wanted to buy electric cooking stoves with battery attached.

WANTED.—To sell outright or on royalty, high speed cloth winding and measuring machine for dry goods. Patent No. 884,690. Bolts perfectly. Accurate. Address Edward Blythe, Decatur, Texas.

Inquiry No. 8624.—Wanted to buy portable rivet heaters.

HELP WANTED.

ENGINEERS, FIREMEN.—Young men, if you are thinking of becoming either one—Marine or Stationary—write Harry A. Bush, 70 Waite St., Malden, Mass.

Inquiry No. 8628.—Wanted to buy paving block machines for use with partly fluid substances.

WANTED.—A partner to have my patent for "Exerciser" patented in foreign countries and manufactured in the U. S. Alfred Limoges, Verner, Ont., Canada.

Inquiry No. 8632.—Wanted to buy machine for perforating music rolls.

WANTED.—An expert engineer on air-designing and developing pressure and vacuum machines. For further particulars address Engineer, Box 773, New York.

Inquiry No. 8643.—Wanted to buy concrete post machines.

BOOKS AND MAGAZINES.

WIRELESS TELEGRAPHY.—Send 10 cents for special number of Electrician and Mechanic, devoted to this subject. Articles on how to make a 4-inch induction coil, magnetic detector, independent interrupter, indoor wireless, adjustment of detectors on tuned circuits, wireless telephony, storage batteries. Also hall seat, 16-foot launch, model engine, telephone installation, mechanical drawing, etc. List of electrical and mechanical books free. Sampson Publishing Company, 1151 Beacon Building, Boston, Mass.

Inquiry No. 8644.—Wanted address of glass tube manufacturer who does bending.

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BUTCHER'S BOSTON POLISH is the best finish made for floors and interior woodwork. Not brittle; will not scratch or deface like shellac or varnish. Send for free booklet. For sale by dealers in Paints, Hardware and House Furnishings. The Butcher Polish Co., 356 Atlantic Avenue, Boston, Mass.

Inquiry No. 8646.—Wanted to buy cheap small motor from ⅛ to 1 horse power, single phase 60 cycle, 110 volts.

LISTS OF MANUFACTURERS.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at the rate of $15.00 per thousand, in large quantities, for big industries and callings. Small and special lists compiled to order at various prices. Thus 100 windmill manufacturers list would cost $2.50, etc. Address A. A. H., Box 773, New York.

Inquiry No. 8649.—Wanted to buy non-inflammable celluloid.

A LIST OF 1,500 mining and consulting engineers on cards. A valuable list for circularizing. Price $15.00. Address A. A. H., Box 773, New York.

Inquiry No. 8650.—Wanted to buy file cutting machinery.

Inquiry No. 8652.—Wanted address of manufacturers of drop forged wrenches.

Inquiry No. 8653.—Wanted addresses of dealers in sheet steel, New York city preferred.

Inquiry No. 8654.—Wanted addresses of case-hardeners in New York.

Inquiry No. 8660.—Wanted to buy creosote making machinery.

Inquiry No. 8661.—Wanted to buy machinery for making cutlery.

Inquiry No. 8662.—Wanted to buy small machine for drawing thread from cotton and machine for making lozenges.

Inquiry No. 8666.—Wanted to buy screw making machinery.

Inquiry No. 8667.—Wanted to buy needle, pin and pen machinery.

Inquiry No. 8669.—Wanted to buy machinery for making rifle barrels.

Inquiry No. 8671.—Wanted to buy welting and machinery for making same.

Inquiry No. 8672.—Wanted to buy 2,500-pound gasoline traveling crane.

Inquiry No. 8674.—Wanted to buy machinery for cultivating rice and making Yuca starch.

Inquiry No. 8675.—Wanted to buy machinery for making sawdust into bricks for fuel.

Inquiry No. 8678.—Wanted to buy cheap sewing machines.

Inquiry No. 8679.—Wanted to buy cheap guns.

Inquiry No. 8680.—Wanted to buy cheap watches.

Inquiry No. 8681.—Wanted to buy envelope making machines.

Inquiry No. 8682.—Wanted to buy model of old battleship "Maine."

Inquiry No. 8683.—Wanted to buy plant for making cassava starch.

Inquiry No. 8685.—Wanted to buy 1¼ to 2-inch No. 18 to 18 tempered spring steel.

Inquiry No. 8687.—Wanted to buy motor plows.

Inquiry No. 8691.—Wanted to buy for export to British Guiana alcohol motors.

Inquiry No. 8692.—Wanted to buy kerosene oil motors for export.

Inquiry No. 8693.—Wanted to buy meteorological instruments.

Inquiry No. 8694.—Wanted to buy fly wheels and ball bearings.

Inquiry No. 8696.—Wanted to buy toy balloons.

Inquiry No. 8697.—Wanted to buy zinc can screw tops.

Inquiry No. 8698.—Wanted to buy a hydrochloric acid plant.

Inquiry No. 8699.—Wanted to buy two-stranded soldered wire for heddles.

Inquiry No. 8701.—Wanted to buy solar engines.

Inquiry No. 8705.—Wanted to buy double shaft engines for automobiles.

Inquiry No. 8706.—Wanted to buy ink and mucilage bottles and labels.

Inquiry No. 8707.—Wanted to buy hand power vacuum cleaner.

Inquiry No. 8709.—For manufacturers of gut cleaning machines.

Inquiry No. 8710.—For machinery for carding, spinning and weaving jute.

Inquiry No. 8713.—For manufacturers and dealers of cement manufacturing machinery and kilns.

Inquiry No. 8716.—For manufacturers of flower garden and light frame tools for cultivating, etc.

Inquiry No. 8717.—Wanted address of firms that do wood carving or stone carving, ornamental or in buildings.

Inquiry No. 8719.—For manufacturers of safes.

Inquiry No. 8720.—Wanted for mail order business, no-chimney lamp burners.

Inquiry No. 8721.—Wanted unwelded tubing that is used for structural work.

Inquiry No. 8722.—Wanted manufacturers of glass.

Inquiry No. 8723.—Wanted addresses parties dealing in mining machinery such as used in gold mining.

Inquiry No. 8724.—Wanted to buy samples of various kinds of French marble for collection.

Inquiry No. 8725.—For manufacturers of a needle-threader, not the thimble and needle combination.

Inquiry No. 8726.—For parties who make "Yankee Metal Polish."

Inquiry No. 8727.—For manufacturers of small stills for distilling alcohol.

Inquiry No. 8728.—Wanted the address of The Frear Novelty Co.

Inquiry No. 8729.—Wanted a machine for manufacturing berry-crates complete.

Inquiry No. 8731.—Wanted a rice mill or huller that delivers the rice entire and separate from the hull.

Inquiry No. 8732.—For manufacturers of industrial alcohol machinery.

Inquiry No. 8733.—For manufacturers of gates to be opened from a buggy.

Inquiry No. 8734.—Wanted to buy fusible metal which melts at 165 degrees, similar to that used by manufacturers of automatic sprinkler heads, also who makes the disks used to keep the head normally closed.

Inquiry No. 8735.—For parties making a still for the purpose of extracting alcohol from saw-dust.

Inquiry No. 8736.—For manufacturers of machinery for making matches, also machinery for making purses and hand bags.

Inquiry No. 8737.—For manufacturers of machinery for making tooth-brushes, shaving brushes, galvanized water buckets, locks, nibs and holders.

Inquiry No. 8738.—For parties manufacturing casein cement.

Inquiry No. 8739.—Wanted machinery to make pencil and pen retainer made of spring wire.

Inquiry No. 8740.—For manufacturers of Chicago typewriter.

Inquiry No. 8741.—For manufacturers of fireless cookers.

Inquiry No. 8742.—For manufacturers of water still, also of thermometer tubing.

Inquiry No. 8743.—Wanted to buy a machine to make macaroni, spaghetti and vermicelli to turn out 100 lbs. per day of each, by hand power.

Inquiry No. 8744.—Wanted a machine for making briquettes for fuel from wooden shavings or combined with pitch or other binder.

Inquiry No. 8745.—For manufacturers of hoops such as used as toys, varying in diameter from 2½ to 4 feet, cross section approximating ⅜x⅜ inch, the ends being lapped and tacked.

Inquiry No. 8746.—For dealers in paper and card-board making machines.

Inquiry No. 8747.—For manufacturers of iron or brass tubing, both round and square, in large quantities.

Inquiry No. 8748.—Wanted to buy polished or lacquered brass in sheets 29 gauge, quarter hard in temper.

Inquiry No. 8749.—For makers of very large springs, used for running machinery.

Inquiry No. 8750.—Wanted to buy gasoline plowing and traction engines.

Inquiry No. 8751.—For manufacturers of brass, tea, dessert and table spoons for silver plating.

Inquiry No. 8752.—For manufacturers of paper mill machinery for the manufacture of strawboard and wrapping paper.

Inquiry No. 8753.—For manufacturers of hotel register revolving stands and hotel novelties.

Inquiry No. 8754.—For the party who makes an umbrella which when raised allows the holder to stand directly under it, the handle being away from the center.

Inquiry No. 8755.—Wanted to buy boat loads of lumber to be used in box making.

Inquiry No. 8756.—Wanted to buy novelties of all kinds.

Inquiry No. 8757.—Wanted address of the manufacturer of "The Index Incandescent Kerosene Burner."

Inquiry No. 8758.—Wanted to buy machinery for making cork stoppers and where to buy the cork.

Inquiry No. 8759.—For a firm to do porcelain enameling of ventilator tops, such as used on the outside of arc lamps.

Inquiry No. 8760.—For a manufacturer who can manufacture a new type of hook and eye device.

Inquiry No. 8761.—Wanted to buy a small carriage propelled by electricity so that a lame person may get about by himself.

Inquiry No. 8762.—For manufacturers of a patented pants stretcher made mostly of wood, the top and bottom clamps being extended apart by two wooden slips which are connected by some sort of adjustment feature.

Inquiry No. 8763.—Wanted parties who can make ornaments of wood pulp scroll-shaped.

Inquiry No. 8764.—Wanted to buy smokers' fancy goods of all kinds.

Inquiry No. 8765.—For manufacturers of insulating paper linings used in metal covers of electric snap switches; also makers of insulating papers and tools.

Inquiry No. 8766.—For parties making pressed paper goods.

Inquiry No. 8767.—Wanted to buy cars for a railroad with a radius of 100 miles, which will run by gasoline power.

Inquiry No. 8768.—For manufacturers of black plate glass.

Inquiry No. 8769.—For manufacturers of an appliance to attach to the old style razor blade to make same a safety razor.

Inquiry No. 8770.—For parties who make short link twist chains, links from ⅛ inch up.

Inquiry No. 8771.—Wanted to buy tune sheets for Criterion music boxes.

Inquiry No. 8772.—For a machine to make paper bottles for holding milk.

Inquiry No. 8773.—For manufacturers of distilling machinery for making alcohol and denaturizing the same with small capacity.

Inquiry No. 8774.—For machinery for making bags from sisal hemp.

Inquiry No. 8775.—Wanted to buy stock novelty or jewelry catalogues.

Inquiry No. 8776.—For manufacturers of mail order novelties and also manufacturers of hand power vacuum cleaner machines.

Inquiry No. 8777.—Wanted to buy a portable photographing outfit for street use.

Inquiry No. 8778.—For manufacturers of reapers, binders and mowers.

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Shelving, adjustable, E. Allen 891,968
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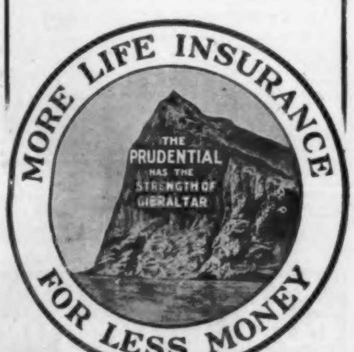

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Oils, cotton seed, Southern Cotton Oil Co.... 69,714
Oils, cotton seed, Wesson Co................ 69,721
Paper and envelops, writing, G. B. Hurd & Co. 69,663, 69,665
Peanuts, Barnhart Mercantile Co. 69,697
Pencils and penholders, safety holders for, L. E. Waterman Co. 69,667
Petroleum, refined, Standard Oil Co. of New York 69,674, 69,676
Pills, R. N. Bates 69,724
Pipes, Reiss Bros. & Co. 69,712
Plows and parts of same, Chattanooga Plow Co. 69,742
Plumbing supplies, certain, Ahrens & Ott Mfg. Co. 69,657
Post and congratulatory cards, H. A. Schwerdtfeger & Co. 69,673
Post cards, I. Neuburg 69,670
Poultry fountains, cups, and feeders, L. Bischoff 69,726
Preservatives and disinfectants, Atlas Preservative Co. 69,722
Remedies for certain diseases, C. Lowel ... 69,734
Remedies for certain diseases, Red Circle Pill Co. 69,736
Remedy for tuberculosis, A. Thamm........ 69,741
Ribbons, John V. Farwell Co. 69,733
Ribbons, R. Sarasin & Co. 69,752
Rope, fiber, C. W. Hunt Co. 69,699
Salve, B. Kobosoff 69,748
Salves, M. A. Zalewski 69,755
Scientific instruments, certain, Heath & Co. 69,730
Soaps, L. T. Piver et Cie.................. 69,711
Soda, washing, Polk & Calder Drug Co...... 69,735
Suspenders, Harris Suspender Co. 69,729
Swings, chain, Oneida Community........... 69,671
Tablets, breath purifying, G. A. Kruttschnitt 69,747, 69,749
Tobacco products, certain, W. T. Donovan.. 69,661
Tobacco products, certain, C. N. Reed & Co. 69,672
Tonics, J. J. Lauffer 69,750
Vehicles and parts thereof, certain, Birmingham Small Arms Co. 69,725
Vehicles and parts thereof, certain, Daimler-Motoren-Gesellschaft 69,756
Vending machines, Hilo Gum Co. 69,662
Watch movements, Elgin National Watch Co. 69,677
Watches and watch movements, J. Racine & Co. 69,681
Water, carbonated or aerated, Ironite Co.... 69,704
Waterproofed fabrics, certain, Cravenette Co. 69,743
Waxing pads, Waxo Manufacturing Co...... 69,753
Wines, still, J. P. Laroche & Co. 69,707

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"Antihedake," for hats, F. Meyer 14,269
"Don Grando," for cigars, Seeman Brothers. 14,262
"Fruit Extracts," for fruit extracts for beverages, Adrion Bros. 14,264
"Lowney's Milk Chocolate Creams," for milk-chocolate creams, Walter M. Lowney Co. 14,267
"Lowney's Nugatines," for nugatines, Walter M. Lowney Co. 14,265
"Malt Foam," for a malt beverage, Grand Rapids Brewing Co. 14,263
"Manheim Mendless Socks," for hosiery, Manheim Hosiery Mills Co............... 14,270
"Merry Widow," for chocolates, National Candy Co. 14,266
"Sea Rose," for canned salmon, Schmidt Lithograph Co. 14,268
"See its Spring," for dress fasteners, William Prym, Gesellschaft mit beschrankter Haftung 14,271
"Stickem," for sanitary fly tape, Arents Manufacturing Co. 14,272

PRINTS.

"Baby Bright Eyes," for toasted corn flakes, Toasted Corn Flake Co........... 2,308
"Bobby Bright Eyes," for toasted corn flakes, Toasted Corn Flake Co........... 2,309
"Bradley White Ash Coal," for coal, Clay Coal Co. 2,318
"Bridget Bright Eyes," for toasted corn flakes, Toasted Corn Flake Co........... 2,306
"Calumet," for whips, Independent Whip Co. 2,315
"Class Pin, Page Number Three," for class pins, S. L. Folger 2,312
"Doctor Bright Eyes," for toasted corn flakes, Toasted Corn Flake Co........... 2,304
"Father Bright Eyes," for toasted corn flakes, Toasted Corn Flake Co........... 2,311
"Golden Rule," for whips, Independent Whip Co. 2,316
"Grandma Bright Eyes," for toasted corn flakes, Toasted Corn Flake Co........... 2,309
"Grandpa Bright Eyes," for toasted corn flakes, Toasted Corn Flake Co........... 2,310
"King Rawhide," for whips, Independent Whip Co. 2,317
"Mother Bright Eyes," for toasted corn flakes, Toasted Corn Flake Co........... 2,305
"The Staclene Cuff Protector," for collar and cuff protectors, E. B. Maxon & P. S. Lohnes 2,313
"Three Horse Head," for whips, Independent Whip Co. 2,314

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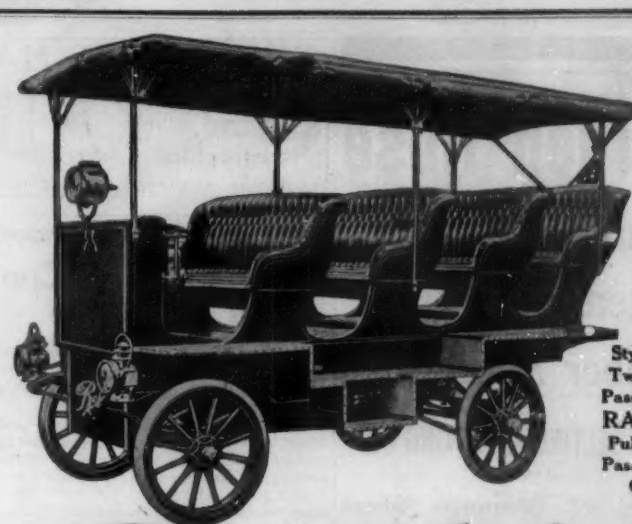

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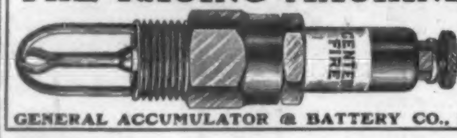

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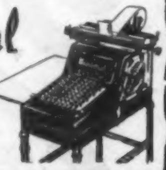

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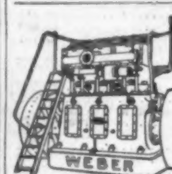

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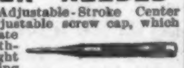

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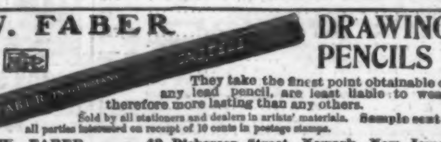

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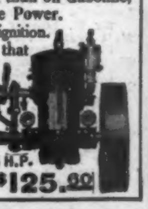

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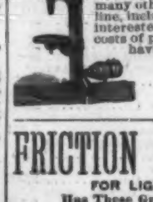

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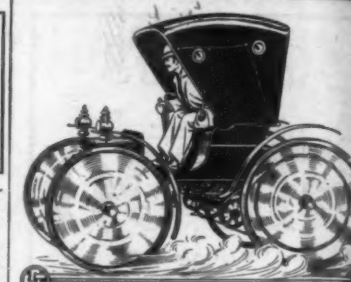

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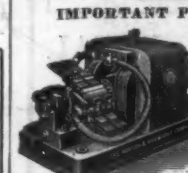

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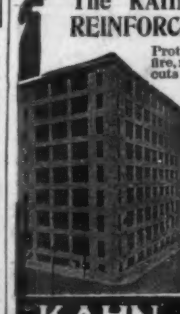

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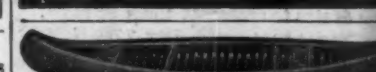

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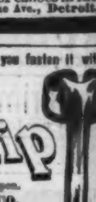

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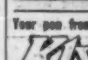

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